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MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974

Richard Edward Blumberg

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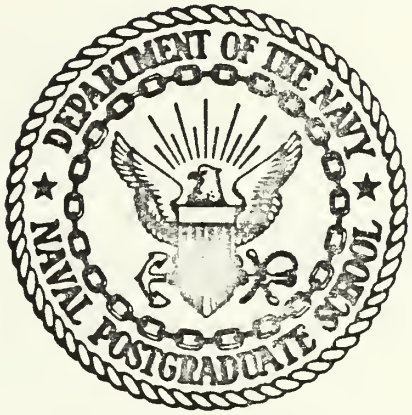

THESIS

MESOSCALE SPATIAL AND TEMPORAL VARIATIONS OF WATER MASS CHARACTERISTICS IN THE CALIFORNIA CURRENT REGION OFF MONTEREY BAY IN 1973-1974

by

Richard Edward Blumberg

September 1975

Thesis Advisor: Jacob B. Wickham

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1. REPORT NUMBER	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Mesoscale Spatial and Temporal Variations of Water Mass Characteristics in the California Current Region Off Monterey Bay in 1973-1974	5. TYPE OF REPORT & PERIOD COVERED: Master's Thesis, September 1975 / 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Richard Edward Blumberg	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Naval Postgraduate School, Monterey, California 93940	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: Naval Postgraduate School, Monterey, California 93940	12. REPORT DATE: September 1975 / 13. NUMBER OF PAGES: 142
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): Naval Postgraduate School, Monterey, California	15. SECURITY CLASS. (of this report): Unclassified / 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Continuous salinity and/or temperature profiles were made off the coast of Monterey Bay monthly between August 1973 and August 1974 and on a spatial grid finer than is conventionally used. A procedure is described to convert the data from analog to digital form, process these data on an IBM 360 computer, and print out the results by station for each month.

The results show water mass features of small spatial scale detectable only because of the small grid spacing. A gyre or

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Mesoscale Spatial and Temporal Variations of Water Mass Characteristics in the California Current Region Off Monterey Bay in 1973-1974

by

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Lieutenant, United States Navy
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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN OCEANOGRAPHY

from the

NAVAL POSTGRADUATE SCHOOL
September 1975

Thesis
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ACKNOWLEDGEMENTS

This thesis involves many to whom I owe much for their encouragement and support. My special thanks go to LCDR Charles E. Workman and Mr. Paul D. Stevens of the Fleet Numerical Weather Central for their assistance in providing the digitizer facilities. I would like to thank Associate Professor Robert G. Paquette, Mannas Anderson, Kristina L. Butler and Edwin V. Donnellan for their advice on running the computer programs and their assistance in their preparation and utilization. I would also like to thank Richard E. Greer and John G. Hughes for their assistance in working up the data. I would like to express my sincere appreciation to my advisor, Associate Professor Jacob B. Wickham, for his encouragement of this project and his recommendations for its content.

I. INTRODUCTION

A. CALIFORNIA CURRENT SYSTEM

The California Current system has been described in terms of three general periods based on the particular dominant feature which occurs during that part of the year. The three periods are: the Davidson period (mid-November to mid-February), the upwelling period (mid-February to the end of July) and the oceanic period (end of July to mid-November). The different conditions that exist during these periods are the result of the offshore currents and the predominant winds [Sverdrup, Johnson, and Fleming, 1942].

Two currents are important. The first, the California Current, is formed by parts of the North Pacific Current and the Subarctic Current and flows southward along the west coast of the United States between 48°N and 23°N. The current is wide and flows sluggishly to the southeast until, off Central America, the current turns west and becomes the North Equatorial Current.

The second important current is the relatively warm Davidson Current. This is a coastal countercurrent inshore of the California Current along the west coast of the United States [Glossary of Oceanographic Terms, 1966]. It may be present as a surface or as a subsurface current and has also been called the California Countercurrent by some investigators.

The California Current system is found between a cell of high atmospheric pressure to the west and a low pressure cell over the land to the east. The western cell often dominates; thus the winds over the California Current are generally from the north and west. These pressure cells change their relative positions and strengths, and cause a seasonal variation in the winds along the coast. For example, between spring and fall the winds are primarily northerly. When strong enough and combined with the Coriolis Force this wind drives the surface water away from the coast giving rise to upwelling. In the winter the northerly component of the wind weakens or reverses. This corresponds to the period when the Davidson Current flows northward on the surface [Edmisten, 1974]. In addition to the variability in the current structure due to the interaction with the local wind, other factors, including changes in global scale wind patterns, contribute to both the long term and the short term changes in the water mass distribution.

B. PREVIOUS STUDIES

The distribution of the water masses and the interaction of the current off the west coast of California have been examined by a number of investigators whose works are summarized by Molnar, Brown, and Edmisten. Only some of the more interesting characteristics of water mass distribution within the California Current system will be described here.

The nature of the Davidson Current changes with the season. During the Davidson period the countercurrent is present at all depths on the coastal side of the California Current to at least 48°N latitude. The upper homogeneous layer is relatively thick, that is, the temperature at 25m is nearly the same as the surface temperature and at 50m the temperature is only slightly lower [Sverdrup, et al., 1942]. Satellite reconnaissance of the California coastal currents between July 1972 and May 1974 provides an additional source of information on the surface current patterns. The ERTS-1 (Earth Resources Technology Satellite) imagery analysis of the Monterey Bay area showed a very uniform surface current pattern during the Davidson Current period. The horizontal variation was very slight although no regular pattern of water mass distribution was discernible. The northward flowing Davidson Current was not observed to be present within about 30 km offshore during November and December 1973. However, it was recorded to be present on the surface in January and February 1973 [Pirie, and Steller, 1974].

As the winds shift to the north, or northwest in early spring the Davidson Current breaks up into a series of eddies as upwelling intensifies [Brown, 1974]. The Davidson Current is still present below 200 to 250 m, and according to Sverdrup, in the absence of the winds which cause the upwelling, the Davidson Current would be present on the surface. The upwelling period is characterized by a rise in the

isotherms toward the coast where the temperature is about 3° C lower than further offshore. The water which is carried toward the surface is from the upper 200m. Below 200m the slope of the isotherms is opposite to those in the surface layer. This downward slope may be indicative of a reversal of current direction toward the north [Neumann and Pierson, 1966].

During the Oceanic period the California Current is dominant throughout the area of survey. However, the Davidson Current is still present at depth.

The ERTS-1 imagery analysis illustrated the complexity and variability in the current structure. Several months showed both warm and cold components to be present offshore (January and February 1973), while other months indicated no definite flow direction but showed a series of gyres and area of mixture of the water of the two currents (April, September, October, November and December 1973) [Pirie, et al., 1974]. This complex structure is in agreement with the work of Scripps Institution of Oceanography as reported by Sverdrup. In the areas of intense upwelling tongues of water of low temperature extend southward away from the coast and between these tongues are higher temperature tongues extending in toward the coast. The flow within the warm tongues is directed toward the north and the flow within the cold tongues is directed toward the south.

Reid, Roden and Wyllie [Brown, 1974] described four water masses that contribute to the California Current system. The Subarctic Water Mass and the Central Water Mass come in from the west and northwest. The Davidson Current is from the Equatorial Water Mass to the south. The fourth water mass is the result of the upwelling process along the coast. This classification scheme was later simplified to a "northern" water mass called Subarctic North Pacific Water and a "southern" water mass called Equatorial Pacific Water [Brown, 1974].

The terms "northern" and "southern" water will be used in this paper to describe the water mass characteristics in the area of study, rather than their places of origin. Northern water is water which appears colder and less saline than the water of the same density surrounding it. Similarly, southern water is water which is relatively warmer and saltier than the surrounding water of the same density.

C. OBJECTIVES

The primary goal of this study is to describe the annual variation in the structure of the water mass distribution in the area of survey and to document the procedure which was used to process the data. This description is based on a year's monthly observations using continuous profiling sensors. Specifically, the following points are discussed:

1. A procedure for processing a large quantity of analog salinity, temperature and depth (STD) data and expendable bathythermograph (XBT) data is described.

2. Two computer programs to process this data were modified and are documented in Appendices D and E.

3. The water mass distribution is examined on a small spatial scale (5 km between stations) in order to see on what scales the variation occurs.

4. The extent of the survey area is considered and its sufficiency to describe the water mass distribution is discussed.

5. The water mass properties were observed once a month for 13 months in order to describe the annual variation in the water masses.

II. DATA COLLECTION AND PROCESSING

A. DATA COLLECTION

The oceanographic research vessel, Acania, was used to collect data monthly from August 1973 to August 1974 under the supervision of J. B. Wickham of the Naval Postgraduate School. The instrumentation, navigation, and data collection procedures are detailed in Reference 10. Briefly, a Bisset-Berman continuous profiling salinity, temperature, depth recorder (STD) was used to collect data during the months August 1973 through January 1974, and August 1974. From February through July 1974, the STD was inoperative and data were collected using expendable bathythemographs (XBT). No data were collected in April 1974 and insufficient data were collected in September 1973 due to inclement weather. Independent measurements of salinity and temperature were made at selected depths using Nansen bottles, a conductivity salinometer, and reversing thermometers during both the STD and the XBT cruises.

Figure 1 shows the area which was examined and Figure 2 shows the location of the stations, although not all of the stations were sampled each month. As noted in Reference 10, the use of a station spacing of 5 km is a finer grid than is traditionally used in oceanographic survey work but it is necessary to define narrow streams of northern and southern water.

B. CALIBRATION

The vertical definition as a result of collecting the data with the Bisset-Berman continuous profiling STD is estimated to be a few meters or less. This is based on a rate of drop of about 30 meters per minute.

After the data had been collected the STD and XBT traces were compared with the reversing thermometer temperatures or the salinities from the Nansen bottles to determine if a temperature correction (TCOR) or a salinity correction (SCOR) was necessary. TCOR was determined by plotting the value of temperature from the trace, T_{STD} or T_{XBT}, along one axis against the temperature from the reversing thermometers, T_N, along the other axis for the same depth. The number of points plotted was a function of the number of Nansen casts taken at all stations for the particular month in question. If T_{STD} and T_N were the same for each point, a 45° line through the origin would connect the points. If the best fit line did not pass through the origin the constant correction, TCOR, was applied to shift the line back to the origin.

$$TCOR = T_N - T_{STD}$$

The salinity correction, SCOR, was determined in a similar manner using the salinity of the water in the Nansen bottles and the salinity on the STD traces.

$$SCOR = S_N - S_{STD}$$

The XBT traces were standardized to reversing thermometer temperatures in a similar manner except that TCOR was determined from the Y intercept of a straight line through the various points computed by the WLQP2 subroutine in the W. R. Church Computer Center subroutine library. WLQP2 is a least square polynomial fit and, by calling for the best fit first order polynomial, a straight line through the data points is produced. The data points were again determined by using the temperature from the XBT trace and the temperature from the reversing thermometer of the Nansen casts at the same depth.

During several months there were no Nansen casts taken at the XBT stations. However, there were a number of stations at which both STD and XBT data were collected, and still other stations at which Nansen and STD data were collected. This enabled a determination of the temperature correction, TCOR, for the STD data as explained above:

$$TCOR = T_N - T_{STD}$$

The XBT data were then compared to the corrected STD data and a constant correction, XBTCOR, was determined and applied to the XBT data for that particular month.

$$XBTCOR = T_{STD} - T_{XBT}$$

Generally, the XBT temperatures were higher than the STD temperatures and, by applying the XBTCOR correction, a reasonable comparison between STD and XBT data can now be made.

One final check on the corrected data was conducted after the processing computer programs, DIGISTD and DIGIXBT, had been run. The computer printouts for a number of stations were examined at randomly selected depths. These values of temperature or salinity were compared with the values read from the traces. The computer printouts and the traces were in agreement after the constant correction, TCOR, SCOR or XBTCOR, had been applied.

C. DATA PROCESSING

To prepare the data for analysis the STD and XBT traces were examined visually, smoothed by removing spurious spikes, and marked for ease of digitizing. They were then taken to Fleet Numerical Weather Central, Monterey, where the data were converted from analog to digital form using a Calma Company digitizer. Operation of the Calma digitizer is explained in Appendices A and B. The digitizer records the data on a 556 bpi, 7-track magnetic tape which was then processed at the W. R. Church Computer Center using the appropriate program, DIGISTD or DIGIXBT. The computer programs are listed and explained in Appendices D and E. The resulting output is a listing by station of depth and temperature for the XBT data. The STD output consists of a listing by station of depth, temperature, salinity and the calculated value of sigma t. Sound velocity is also calculated for the STD traces but will not be discussed in this paper. The computer output can be

in one of several forms: a paper printout, a punched card printout or a 9-track magnetic tape. The 9-track tape was used to supply the data for the plotting programs XBTPLT or STDPLT which are listed in Appendices F and G.

1. Trace Preparation

The individual STD or XBT traces were treated in the same general manner. The STD salinity trace required special preparation since spikes are artificially introduced in the salinity trace by the equipment [Wickham, 1975]. The up and down traces were stapled together so the traces were superimposed. If a spike appeared on one trace and not on the other or if two spikes were oriented oppositely, they were ignored. The down trace was then outlined in pencil to make it easier for the digitizer operator to record the data. The XBT and STD temperature traces were traced only in areas where the original ink was difficult to see because it was smeared or too light to be digitized easily. A small circle was drawn to mark the beginning and end of each segment of the trace. A segment is an entire section of the trace recorded at a single set of depth, temperature and salinity scales. If one scale changes, the pen drawing of the STD trace is repositioned and a new segment is started.

2. Calma Digitizer

The Calma Company Model 480 digitizer reduces analog graphical data to digital form for computer processing and analysis. Two machines were used to process the data and

are located at the Fleet Numerical Weather Central, Monterey, California.

Reference 2 describes the operation of the digitizer. To digitize analog graphical data directly onto computer-compatible magnetic tape, the operator manually traces the graphical data with a movable stylus/carriage assembly. The location of the stylus is transmitted through cables to magnetic reluctance encoders, which convert stylus movement to digital signals. The signals are processed and formated for output on a 556 bpi, 500 cps, magnetic tape. Also recorded on the tape, through a manual keyboard entry, are the required identification codes such as station number, month, scaling factors, inter-record gap, error correction and others as desired, which are used by the final processing computer programs.

The maximum sampling interval for the STD data was 0.02 inch of stylus movement in either the X or Y direction. This sampling interval is a function of the stylus speed and, for most of the data, the stylus position was recorded at every .01 inch. The .02 inch sampling interval corresponds to a maximum depth change between recorded data points of approximately .66 m for the 0 to 300 m scale, and 1.75 m for the 0 to 750 m scale. The maximum temperature change between data points is about .01°C, and the maximum salinity change between data points is about .004 ppt.

For the XBT data the .02 inch corresponds to a maximum depth change between recorded data points of 2.0 m and a temperature change of .1°C. The Calma digitizer itself has a maximum absolute error of .012 inches or 0.1%. In summary, the error introduced during the digitizing procedure is more significant for the XBT data than the STD data but is still very slight over the range of depth and temperature.

III. RESULTS

Figures 3 through 19 are vertical cross sections of the area of survey showing the isotherms between 6.5°C and 12.0°C for each month. Figures 3 through 9, and 19 are based on the STD data and have lines of constant sigma t (isopycnals) plotted in addition to the isotherms. The XBT data are the basis for Figures 10 through 18 and, since there were not enough Nansen stations to determine the salinity distribution, the density structure is not shown.

The figures were plotted by using the CONTUR subroutine from the W. R. Church Computer Center subroutine library. This program does not allow for gaps in the data. Therefore, the depth of the plots is limited to the depth of the shallowest station taken during each month. In certain cases a particular station was either too shallow or the data were too unrealistic to be plotted, or there were no data taken for that particular station at all. The net result is that the figures must be examined carefully because the station spacing is not uniform. The stations appear uniformly spaced even if the actual distance between stations is not constant.

The shaded areas on the figures represent the major areas of northern and southern water. For example, in Figure 3 the warm southern water is characterized by isotherms which dip below the 26.7 sigma t surface at stations 110 and 111. This slope of the isotherms is much steeper than the depression in the 26.9 sigma t surface just below and indicates the

presence of water which is warmer than the adjacent water of the same density and depth at station 109.

The cold northern water has isotherms which slope upward more steeply or rise up above the constant sigma t surface. This is particularly evident in Figure 3 at station 108 on the 26.3 sigma t surface. At the other density surfaces for station 108 the isotherms and density surfaces both slope upward in the same general direction but the slope of the isotherms is more pronounced. The difference in the slopes of the isotherms and the isopycnals is important because it differentiates between local vertical motion due to internal waves or upwelling and differences in water mass structure due to horizontal advection.

An exception to this which is particularly important in analyzing the XBT data is the apparent slope in the isotherms which is due to bad data. For example, station 303 in Figure 12 has each isotherm depressed through the entire water column giving the appearance of being a relatively warm water intrusion. Because the depression is limited to the one station and appears over the entire 450 m depth, it is probably due to a faulty XBT, a misaligned recording trace, or improper digitizing.

Another problem which is unique to the XBT is illustrated in Figure 17 between stations 202 and 204. The surface values down to a depth of about 300 m appears to be normal in that the isotherms are horizontally consistent. Below 300 m an

apparent narrow warm intrusion appears at station 204. This anomaly is probably instrumental since the adjacent station 203 is consistent with station 205. The problem is that the XBT has a limited quantity of wire available. The recommended depth for this group of sensors was 450 m. If the wire is tangled or if the probe goes deeper than the wire is long, the wire will be stretched for a period of time before it breaks. When this wire is stretched, the recorded temperature becomes erratic. It is difficult to differentiate a real change in temperature from this artificial anomaly. In order to validate this sort of temperature change at depth, some sort of independent measurement is required, perhaps with another XBT or with a Nansen bottle and reversing thermometers. Although a number of Nansen casts were made, there were none taken at these stations. Because there are no isopycnals nor enough independent measurements to verify the structure indicated by the isotherms, it is not possible to state positively whether a specific feature is real or artificial. The following figures contain structures which appear to be the result of bad or stretched XBT's: Figure 12 - station 303, Figure 14 - station 315, Figure 17 - stations 204 and 202, and Figure 18 - station 312.

The figures will be discussed now in terms of the three oceanographic seasons. Figures 3, 4, and 5 are from August 1973. This is during the oceanic period which is from July through November. They show the presence of the southern

water below 200 m in the southern section of the area of survey. The warm water is present about 45 km offshore in Figure 3. Figure 4 is from the stations 20 km to the north where the warm water is present about 30 km off the coast. However, the warm water is scarcely indicated at all in Figure 5 which is 20 km further north. This shows the diversity in the nature of the water mass distribution. It is not known if the warm water is present further to the west, deeper than 500 m (which is unlikely) or just missing. This would indicate that the warm water to the south is merely part of a filament or gyre that only reached so far north or is discontinuous.

Figures 6 and 7, also from the oceanic period, show the presence of the warm southern water on the western boundary of the area of survey. It is still 100 m below the surface. In both cases a large cold water mass is adjacent to, and on the coastal side of, the warm water.

The Davidson period is between November and February. Figures 7, 8, 9 and 10 correspond to this period and show the presence of southern water at depth. The Davidson Current was expected to be observed on the surface at least in January and February as reported for the previous year in Reference 8. Figure 9 does show a warm water area near the surface in January 1974.

The upwelling period from February to July corresponds to Figures 10 through 18. The upwelling is expected to be

confined to the upper 200 m, and may be a very localized feature. The isotherms are expected to slope upward on the coastal side of the graphs. February (Fig. 10), May (Figs. 13 and 14), and possibly June (Fig. 15) do show upwelling at the eastern boundary. However, it is not clear from the graphs what the nature of the structures are since there are no data further east.

Another prominent feature exhibited on the graphs from May to July is a large warm water mass below 200 m on the eastern edge of the area of survey. Some downward sloping of the isotherms is expected below the areas of upwelling in the presence of a countercurrent as suggested in Reference 7. This theory is further supported by the existence of the same sort of large warm water structure which is seen in Figure 19 for August 1974. The data in Figure 19 are supported by the density structure in that the isotherms and isopycnals do diverge and this indicates the presence of relatively warmer and saltier water.

A comparison of the structure between August 1973 and August 1974 is of interest. August 1973 (Figures 3, 4 and 5) was discussed earlier. The warm water masses are distributed in relatively small areas to the west and central portions of the survey area and very little warm water is present in Figure 5 for the northern stations. The cold northern water is present in August 1973 and is very strong for the 100 and 200 series stations. August 1974 exhibits

structure which is sharply different in that a large mass of warm water is present on the eastern boundary of the survey area and no cold water is obvious. The warm water is present at depth, which is consistent with the previous year and is as expected during the oceanic period. The difference between the months illustrates that although there may be a long time average annual cycle, the short term deviations are very large.

In summary, the data processing procedures to handle a large quantity of analog temperature and salinity data were developed and are detailed in the appendices. This study shows one year's variation in the water mass distribution off the California coast. The nature of these variations dictates the study be made on a small spatial scale. Many of the critical features are less than 10 km wide. The north to south variation is significant as is shown by the data from August 1973. Southern water structures present along the southern line of stations are not present along the same line just 40 km to the north. This suggests that the warm and cold water masses are part of a gyre or filament system as opposed to a strong central cored current.

The area of survey does not appear to be extensive enough to record all of the significant features. Upwelling is indicated on the eastern boundary of several figures but the exact nature of this feature is undetermined. Similarly, many features are identified on the western boundary but the

westward extent is now known and is certainly of interest. Finally, the difference in water mass structure between August 1973 and August 1974 suggests that the secular variation is significant. This is to be expected since the surface current characteristics, direction and speed depend on the prevailing meteorological conditions, which also have a large secular variation.

IV. RECOMMENDATIONS FOR FURTHER WORK

The data show areas which support the concept of three basic oceanographic seasons. However, the boundaries do indicate that areas of interest may lie outside of the area of survey. It is recommended that on future cruises data be collected over a wider area, both to the east and the west.

Between February and July 1974, the STD was inoperative. On future cruises if the STD is not operating, it is recommended that a greater number of Nansen casts be made. This would provide independent information on the density structure and also the reversing thermometers would serve to verify the temperatures recorded by the XBTs.

It is also recommended that an initial on board data analysis be made. This makes possible validation of questionable XBT data by means of an immediate resurvey.

One area of study which was not considered here is the short term temporal variation in the water mass distribution. The data from the monthly cruises may not be representative of the predominant conditions that exist in any one month, but may be the result of recent local weather or storm conditions. Although such a survey may be expensive in both time and money, it would provide valuable information on the structure of the water mass variability.

APPENDIX A

DIGITIZING PROCEDURE

The procedure for using the Calma digitizer will be described for an STD trace but is applicable to an XBT trace as well. The only difference is that the XBT trace is complete in one segment, and the STD trace usually requires multiple segments, which correspond to scale changes of depth (D), temperature (T) or salinity (S). Typically, an STD trace consists of three or four temperature segments and two salinity segments. The term record is used to describe a single complete entry on the digitizer tape. This record may be either a header label, which identifies the station and scale factors for the data which follow, or a trace segment which is the actual digitized data for a segment of T verses D, or S verses D. Appendix B is a checkoff sheet which was used when digitizing the data.

Once the machine is turned on and the magnetic tape is loaded, the first STD trace is taped to the table surface so it will not slip. It is aligned so that the X axis of the digitizer is parallel to the depth axis of the trace and the Y axis is parallel to the temperature/salinity axis. It is important that the trace be rotated 90° and aligned in this manner because DIGISTD and DIGIXBT expect to process data obtained from a trace with this orientation. (The orientation is used because it is easier to control the digitizer stylus

moving left to right for a continuous change in depth than for movement from top to bottom.)

The digitizer has two modes of operation, keyboard and tracer modes. The keyboard mode is used for entering the header label (identification) information on the tape for the data which is digitized and put on the tape when the machine is in the tracer mode. The first thing entered on the tape is the header label for the first station. The elements of the header are named for the acronyns used in the DIGISTD program.

Each of the eleven elements of the header is punched and entered on the tape. No blank spaces are allowed. A typical header is shown in Table I. The keyboard symbol and the inter-record gap (IRG) are put on the tape by pushing these keys on the keyboard. The keyboard symbol marks the beginning of the header and the IRG marks the end of the record.

⌐301k9910430IRG

SYMBOL	NAME	EXPLANATION
⌐	-	keyboard symbol
301	ISTAA	station number
K	AMONT	month designation code
99	IDENT	identifies record as a header
1	IDSCL	depth scale 1
0	ICODE	temperature trace
4	ITSCL	temperature scale 4
3	ISCL	salinity scale 3
0	IP	do not print this station yet
IRG	IRG	inter-record gap

TABLE I. Typical Header Label. This is the first temperature trace segment of an STD trace.

The first three elements of the header comprise a three digit number, called ISTAA in the computer programs. These elements identify the station at which the data were taken. The fourth element of the header is a one letter code called AMONT. This code identifies the particular month and year of the data. The fifth and sixth elements of the header are 99. This is an identification code, called IDENT, used to designate the header label as a header, if the keyboard symbol is missing. If the fifth and sixth characters are not 99 and there is no keyboard symbol, the record is treated as a trace. The next element of the header is called IDSCL in the programs and represents the depth scale at which the data were recorded. DIGISTD allows for three depth scales, a "1" is for a scale from zero to three hundred meters, a "2" is for a scale from zero to seven hundred and fifty meters, and a "3" is for zero to fifteen hundred meters. DIGIXBT has only one scale, a "1". The eighth element of the header is either a "0" or a "1". This element, ICODE, identifies the trace that follows as either a temperature or a salinity trace. In DIGIXBT ICODE is always "0". The ninth and tenth elements of the header are scaling factors for the temperature and salinity scales of the STD which were used when the data were recorded. Table II shows the temperature and salinity scales that are available and are allowed by the DIGISTD program. Only four temperature scales, 2, 3, 4 or 5, and two salinity scales, 3 or 4, were used to record the data. ITSCL and ISCL are both "1" for

DEPTH SCALES

IDSCL=	DEPTH RANGE
1	0 to 300 m
2	0 to 750 m
3	0 to 1500 m

TEMPERATURE SCALES

ITSCL=	TEMP RANGE
1	-2 to 3°C
2	2 to 7°C
3	6 to 11°C
4	10 to 15°C
5	14 to 19°C
6	18 to 23°C
7	22 to 27°C

SALINITY SCALES

ISCL	SALINITY RANGE
1	30.0 to 32.0 ppt
2	31.5 to 33.5 ppt
3	33.0 to 35.0 ppt
4	34.5 to 36.5 ppt
5	36.0 to 38.0 ppt
6	37.5 to 39.5 ppt
7	30.0 to 40.0 ppt

TABLE II. Depth, Temperature, and Salinity Scales.

the DIGIXBT program since there were no temperature scale changes for the XBT trace and no salinity scale at all.

The last element of the header directs the printing of the data. The data are desired only after all segments of a trace have been processed. The stored data are printed out if IP is "1" but not if IP is "0". IP is set equal to "1" only on the last salinity header for a particular STD station. Again, since the XBT trace is a single segment trace, the variable IP is always "1".

After the header label is complete and the IRG key is pushed, the stylus is moved to the origin of the trace. The origin is defined as the intersection of the depth axis with a line perpendicular to it, drawn from the beginning of the trace. The beginning was marked when the data was collected and corresponds to the sensor being at the sea surface. The origin should be marked before the digitizing process starts so it can be located easily. This origin location is necessary because the pen is not always started at the zero meter mark on the record paper. Also, the pens for salinity and temperature are offset from each other about one-eight of an inch to avoid interference between the pens.

When the stylus is on the origin, the tracer mode is activated. The digitizer is then recording the movement of the stylus as it is moved from the origin to the beginning of the trace segment. The beginning of the trace segment is flagged by pressing the "B" and the "A" keys, and then entering this

"BA" on the tape. The stylus is then traced down the segment to its end where an IRG is put on the tape. The digitizer is placed in keyboard mode by pushing "skip" (activate) and then "keyboard". The "skip" button either activates or deactivates the trace accumulator. With skip activated, the stylus may be moved while in tracer mode without changing the digital record.

Digitizing errors may be corrected as follows: The "delete record" key is used when an error has been made when making either a keyboard or a tracer record. The programs process a delete record by ignoring all the data on the tape between the delete record entry and the last previous IRG. The programs begin processing the data put on the tape after the delete record. In this way a minimum of work has to be redone in the event of an error. Because an error in the heading can be overridden by data cards in the processing programs, numerical errors in the heading code should not be corrected by the delete record procedure. Heading errors are detected by using the TAPEOUT program that is explained in Appendix C. The TAPEOUT printout is compared with the desired header to ensure that the codes are correct.

This process of header label followed by trace is continued until all the segments of a trace are recorded. At the end of the tape the "EOF" (end of file) button located on the tape recorder is pushed three times to mark the end of the data on that tape. The tape is rewound and taken to the

W. R. Church Computer Center for processing by way of the DIGISTD or DIGIXBT programs.

APPENDIX B

DIGITIZER OPERATOR PROCEDURES CHECK-OFF SHEET

The following list is a check-off sheet which is a useful guide when using the digitizer.

1. Initial conditions
   A. Transformer on
   B. X-Y plotter off
   C. Tape recorder is left on at all times since power is supplied from the transformer.
2. Load tape
   A. Ensure write permit ring is inserted in tape reel.
   B. Load tape and run forward to the load point by pushing load forward button.
3. Turn the X-Y plotter on (aural tone is heard).
   A. Press record error (aural tone deactivated).
   B. Ensure skip button is lit (activated) and press keyboard.
4. Mount STD or XBT Trace.
   A. Align grid of trace to X-Y plotter by locking X and aligning Y with axis.
   B. Ensure depth increasing in X direction and temp/salinity increasing in Y direction.
   C. Secure trace with masking tape.

5. Enter eleven keyboard entries. (Listing of header labels should have been prepared before digitizing started.)

6. Press IRG.

7. Ensure stylus on previous marked origin.

8. Press trace, deactivate skip.

9. Move stylus from origin to beginning of trace segment.

10. Flag trace by pressing "B" "A" and "enter".

11. Trace segment with stylus.

12. At end of trace, press IRG, press skip and press keyboard.

13. Repeat steps 5 through 12 for all trace segments on this trace and then go on to the next trace.

14. At the end of the day

    A. Ensure skip and keyboard were pressed.

    B. Press EOF (end of file) gap button on the tape recorder three times.

    C. Move the stylus into the lower right hand corner of the table.

    D. Rewind the tape to the load point.

    E. Turn off the X-Y plotter.

    F. Hand wind tape past load point to dismount tape reel.

    G. Turn off the transformer.

Caution: Sudden or very rapid movement of the stylus may cause the cables to come off their pulleys resulting in calibration errors.

APPENDIX C

TAPEOUT

A technical note [Raney, 1973] describes the procedure for using the IBM System / 360 model 67 computer to process 7-track tapes and describes several programs which are useful in processing the tape.

The first program that was run on the 7-track tape was a TAPEOUT program. TAPEOUT is a general purpose tape dump program which is described in detail in Reference 6. Tapeout provides the user with a printout of the recording density (200, 556, or 800 bpi), the tape parity (even or odd) and physical record length (fixed length, fixed blocked, or variable length) and also a partial dump (80 characters) of the record. This information is necessary to prepare the job control language (JCL) cards for the DIGISTD and DIGIXBT programs.

The TAPEOUT program listed below is a modification of the program described in Reference 6.

```
//(STANDARD JOB CARD)
//EXEC TAPEOUT,PARM='1,,1,,32760'
//FT06001  DD SPACE=(CYL,(6,1)),SYSOUT=0
//TAPEIN DD UNIT=2400-1,LABEL=(,BLP),VOL=SER=UCM011
/*
```

This modification prints out the complete tape instead of just 80 characters and also provides the necessary density, parity, and record length parameters. By obtaining a printout of the entire tape, the errors which occurred in the

header during the digitizing procedure are easily identified and located. This is particularly useful during the preparation of the data cards for the DIGISTD, and DIGIXBT programs. For an explanation of the arguments see Reference 6.

APPENDIX D

```
C TITLE          DIGISTD
C
C
C PROGRAMMERS    R.E.GREER,R.E.BLUMBERG,AND J.G.HUGHES EXTENSIVELY MODIFIED AN
C                ORIGINAL PROGRAM,MIZ2, BY R.G.PAQUETTE.
C
C DOCUMENTATION  R.E.GREER
C
C DATE           26 JUNE 1975
C
C PURPOSE        PROGRAM READS,CONVERTS,AND PROCESSES DIGITIZED SALINITY,
C                TEMPERATURE,AND DEPTH DATA FROM A CALMA DIGITIZER 7-TRACK
C                TAPE.  DATA ARE COMPUTED AND STORED EVERY 0.01 INCHES OF DEPTH
C                FOR OUTPUT TO PRINTER,PUNCHED CARD,OR 9-TRACK TAPE.  PROGRAM
C                CONVERTS DEPTH,TEMPERATURE,SALINITY AND COMPUTES SOUND VELOCITY
C                AND SIGMA-T FOR EACH INDIVIDUAL OCEANOGRAPHIC STATION AND
C                PRINTS THE DATA IN A STATION DATA SUMMARY.
C
C SEQUENCE       THE PROGRAM PERFORMS ALL FUNCTIONS IN THE FOLLOWING SEQUENCE
C                OF OPERATIONS:
C                   (A) INITIALIZES ALL ARRAYS AND VARIABLES.
C                   (B) COMPUTES TABLE OF SALINTIY AND TEMPERATURE SCALE
C                   COMVERSION FACTORS.
C                   (C) SKIPS XXX NUMBER OF RECORDS IF NSKP VARIABLE SET OTHER
C                   THAN ZERO ON CONTROL DATA CARD.
C                   (D) READS PAIR OF DATA CARDS (LABEL AND DAT) FOR RECORD
C                   BEING PROCESSED.
C                   (E) TERMINATES PROGRAM IF ISTOP=1 OR AT THE END OF
C                   PROCESSING THE NN-TH RECORD.
C                   (F) SKIPS UNREADABLE OR BAD RECORDS IF NRCSKP VARIABLE SET
C                   TO INDIVIDUAL RECORD NUMBER.
C                   (G) READS USEABLE DATA RECORD INTO A-ARRAY.
C                   (H) MOVES BYTES OF A-ARRAY INTO 4-BYTE WORDS OF B-ARRAY TO
C                   ALLOW PROCESSING BY STANDARD FORTRAN.
C                   (I) PROCESSES RAW B-ARRAY.
C                      (1) IF HEADER RECORD, PROGRAM DECODES HEADER LABEL AND
C                      COMPARES TO LABEL SUPPLIED BY DATA CARD.
C                      (2) IF TRACER RECORD, PROGRAM ADDS AND STORES CUMULATIVE
C                      SUMS OF X AND Y DISTANCE TRAVEL.
C                   (J) INDEXES THE VALUES OF CUMULATIVE DISTANCE BY INCREASING
C                   DEPTH UNITS; INTERPOLATES TO FILL GAPS IN THE FINAL ARRAY
C                   WHICH MAY OCCUR AT THE POINTS OF SCALE CHANGES IN THE
C                   SEGMENTED RECORD.
C                   (K) INSERTS MANUALLY ENTERED SURFACE AND NEAR SURFACE DATA
```

```
C                   VALUES VIA DATA CARD.
C                   (L) INCREMENTS RECORD COUNT AND REPEATS STEPS (D) THRU (K)
C                   UNTIL ALL RECORDS PROCESSED FOR PARTICULAR STATION.
C                   (M) ADJUSTS ALL FINAL DATA ARRAYS TO THE LENGTH OF THE
C                   SHORTEST.
C                   (O) COMPUTES SOUND VELOCITY.
C                   (P) COMPUTES SIGMA-T.
C                   (Q) COMPUTES CONSECUTIVE RECORD SERIALIZATION FOR TAPE
C                   OUTPUT NUMBERING SCHEME.
C                   (R) CONVERTS LETTER DESIGNATOR MONTH/YEAR CODE,AMONC, TO
C                   REAL *8 MONTH/YEAR.
C                   (S) PRINTS OCEANOGRAPHIC DATA STATION SUMMARY.
C                   (T) WRITES ALL STATION DATA ON TAPE IF TAPE=.TRUE..
C                   (U) PUNCHES ALL STATION DATA ON CARDS SUITABLE FOR THESISII
C                   INPUT IF CARDS=.TRUE..
C                   (V) PUNCHES DEPTH,TEMPERATURE,AND SALINITY ON CARDS
C                   SUITABLE FOR INPUT TO HYDROGRAPHIC PROGRAM IF GCARDS=.TRUE..
C                   (W) INITIALIZES ALL ARRAYS AND VARIABLES FOR PROCESSING
C                   NEXT STATION DATA.
C                   (X) REPEATS STEPS (D) THRU (W) UNTIL ALL RECORDS PROCESSED,
C                   ISTOP=1, OR DESIRED RECORD READ.
C
C  FEATURES         PROGRAM CONSISTS OF MANY MARKED PROPERTIES WHICH MAKE IT A
C                   HIGHLY VERSATILE PROGRAM FOR PROCESSING OCEANOGRAPHIC DATA
C                   FROM TAPE. SOME OF THESE PROPERTIES ARE LISTED UNDER THE
C                   FOLLOWING SIX GENERAL CATEGORIES:
C                      (A) INPUT
C                         (1) 7-TRACK CALMA DIGITIZER TAPE IN BCD.
C                         (2) TWO DATA CARDS REQUIRED PER TRACE SEGMENT OR HEADER
C                         LABEL RECORD. EXAMPLE:  AN STD TEMPERATURE TRACE
C                         CONSISTING OF FOUR SEGMENTS OR RECORDS WILL REQUIRE FOUR
C                         PAIRS OF DATA CARDS.
C                      (B) SUBROUTINES
C                         (1) TPRD-  AN ASSEMBLER LANGUAGE SUBROUTINE FOR READING
C                         MAGNETIC TAPE WHICH CANNOT BE READ BY STANDARD METHODS.
C                         NOTE: TPRD ALLOWS USER TO SKIP BAD RECORDS WHILE TAPRD
C                         (W.R.CHURCH COMPUTER CENTER SUBROUTINE) DOES NOT.
C                         (2) CHMOVE-  MOVES BYTES OF A-ARRAY INTO FOUR BYTE WORDS
C                         OF B-ARRAY TO ALLOW PROCESSING BY STANDARD FORTRAN.
C                         (3) CONDNS-  CONDENSES,INDEXES,AND CONVERTS THE
C                         CUMULATIVE DISTANCE X AND Y ARRAYS,BY INCREASING DEPTH
C                         UNITS,TO TEMPERATURE AND DEPTH OR SALINITY AND DEPTH.
C                         (4) OUT1-  PRINTS OCEANOGRAPHIC STATION DATA SUMMARY.
C                         (5) SVEL-  COMPUTES SOUND VELOCITY FROM DEPTH,TEMPERATURE
C                         AND SALINITY ACCORDING TO WILSON'S EQUATION.
C                         (6) SIGMT-  COMPUTES SIGMA-T FROM TEMPERATURE AND
C                         SALINITY ACCORDING TO H.O.614 P.91.
C                      (C) AUTOMATIC DATA PROCESSING/HANDLING
```

```
C                    (1) APPLICABLE TO MULTIPLE DEPTH,TEMPERATURE AND SALINITY
C                    SCALES.
C                    (2) HANDLES OPERATOR MISTAKES MADE IN TRACING STD CURVES
C                    ON CALMA DIGITIZER.
C                    (3) SKIPS AN INITIAL NUMBER OF RECORDS SPECIFIED BY NSKP
C                    AND INDIVIDUAL RECORDS(EVEN IF UNREADABLE) SPECIFIED BY
C                    THE ARRAY NRCSKP.
C                    (4) DECODES 7-TRACK TAPE HEADER LABELS AND TRACE RECORDS.
C                    (5) COMPUTES DATA FOR EVERY 0.01 INCHES DEPTH BUT
C                    SELECTABLE FOR GREATER DEPTH INTERVAL.
C                    (6) ENTERS HAND-ENTERED DATA FOR SURFACE AND NEAR-SURFACE
C                    VALUES.
C                    (7) EDITS OUT ANY UNFILLED ARRAY POSITIONS.
C                    (8) COMPUTES CONSECUTIVE RECORD SERIALIZATION FOR TAPE
C                    OUTPUT NUMBERING SCHEME.
C                    (9) COMPUTES SOUND VELOCITY AND SIGMA-T.
C                 (D) DIAGNOSTICS
C                    (1) WRITES FIRST TWENTY-FIVE VALUES OF B-ARRAY FOR
C                    INSPECTION PURPOSES.
C                    (2) WRITES EVERY TWENTIETH VALUE OF STD ARRAYS FOR
C                    DATA INSPECTION PURPOSES.
C                    (3) WRITES PROGRAM STATEMENT NUMBER IN ADDITION TO
C                    MESSAGE WHEN SIGNIFICANT OPERATIONS OCCUR.
C                 (E) TROUBLE-SHOOTING
C                    (1) HANDLES MULTIPLE KEYBOARD AND TRACER SYMBOL ENTRIES.
C                    (2) PROVIDES FOR A MISSED HEADER LABEL OR INCOMPLETE
C                    HEADER LABEL.
C                    (3) HANDLES MISSING INTER-RECORD GAPS.
C                    (4) HANDLES DELETE RECORD BY INCREMENTING RECORD COUNT
C                    AND READING SAME PAIR OF DATA CARDS AGAIN.
C                    (5) COMPARES CARD HEADER LABEL AGAINST TAPE HEADER LABEL
C                    AND ACCEPTS CARD VALUES IF CARD AND TAPE DISAGREE.
C                 (F) OUTPUT
C                    (1) PRINTER-  TWO PRINTING VARIABLES,PRT1 AND PRT2.
C                       (A) OCEANOGRAPHIC DATA STATION SUMMARIES.
C                       (B) PRT2, PROVISION ONLY.
C                    (2) CARD-  TWO CARD PUNCHING ROUTINES,CARDS AND GCARDS.
C                       (A) PUNCHED DATA CARDS SUITABLE FOR USE WITH THESISII.
C                       (B) PUNCHED DATA CARDS FOR INPUT TO HYDROGRAPHIC
C                       PROGRAM.
C                    (3) TAPE-  9-TRACK TAPE
C                    (4) PLOTTING-  PROVISIONS FOR PLOTTING ROUTINES ACTUATED
C                    BY PLT1 AND PLT2 ARE NOT PRESENTLY PROGRAMMED.
C
C ARGUMENTS       PROGRAM CONSISTS OF MANY TERMS,ARRAYS AND VARIABLES.  THE
C                 FOLLOWING IS A BRIEF DESCRIPTION OF THE IMPORTANT ARGUMENTS
C                 LISTED ALPHABETICALLY UNDER TWO GENERAL CATEGORIES.
C                    (A) ARRAYS
```

```
C
C
C
```

```
C                                   THE NEXT STATION.
C                    (19) IH        = NUMBER OF HAND-ENTERED SURFACE OR
C                                   NEAR-SURFACE DATA VALUES.
C                    (20) IHDR      = WHEN SET EQUAL TO 1 PERMITS
C                                   ENTERING MISSING OR FAULTY DIGITIZER
C                                   TAPE HEADER INFO VIA DATA CARD.
C                    (21) ISTOP     = TERMINATES PROGRAM IF SET EQUAL TO
C                                   1 ON A FINAL &DAT CARD PRECEDED BY
C                                   A LABEL CARD.
C                    (22) JREC      = VARIABLE USED TO COUNT RECORDS FOR
C                                   RECORD SERIALIZATION PURPOSES.
C                    (23) JSKIP     = WHEN SET EQUAL TO 1 ON THE LABEL
C                                   CARD, CAUSES THE PROGRAM TO ACCEPT
C                                   DATA ON AN &CONTRL CARD.
C                    (24) KEY       = THE KEYBOARD SYMBOL ON THE
C                                   DIGITIZER TAPE.
C                    (25) KCRD      = NUMBER OF DATA POINTS TO BE PUNCHED
C                                   BY CARDS PUNCHING ROUTINE.
C                    (26) KDTA      = NUMBER OF RECORDS PROCESSED FOR
C                                   PARTICULAR STATION.
C                    (27) LABEL     = HEADER TYPE DATA CARD WHICH
C                                   IDENTIFIES STATION NUMBER AND TYPE
C                                   TRACE, TEMPERATURE OR SALINITY.
C                    (28) NCRDS     = NUMBER OF CARDS PUNCHED BY CARDS
C                                   PUNCHING ROUTINE.
C                    (29) NE        = THE INDEX AT THE LAST USEFUL ARRAY
C                                   POSITION OF THE X(DEPTH) ARRAY.
C                    (30) NOIRG     = VARIABLE USED TO INDICATE MISSING
C                                   END OF RECORD GAP ON TAPE.
C                    (31) NSKP      = NUMBER OF INITIAL RECORDS ON TAPE
C                                   SKIPPED.
C                    (32) SCON      = SALINITY SCALE CONSTANT.
C                    (33) SCOR      = CORRECTION FACTOR ADDED TO SALINITY
C                                   DATA VALUES.
C                    (34) TCON      = TEMPERATURE SCALE CONSTANT.
C                    (35) TCOR      = CORRECTION FACTOR ADDED TO
C                                   TEMPERATURE DATA VALUES.
C                    (36) WMONTH    = MONTH AND YEAR
C
C DATA DECK          THE FOLLOWING IS A SAMPLE DATA DECK REQUIRED BY THIS
C                    PROGRAM. SAMPLE BELOW SHOWS DATA CARDS REQUIRED FOR TWO
C                    STATIONS, 3070 AND 3080. ALSO SHOWN IS 'STATION END' CARD
C                    WTIH ISTOP SET EQUAL TO ONE.
C
 &CONTRL NN=400,TAPE=F,CARDS=F,GCARDS=F,ISQZ=01,NSKP=90,NRCSKP=103,104,105,
 106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,
 124,125,126,175,176,177,178,179,180,181,182,183,184,185,186,ICSQZ=8,
```

```
IGSQZ=8,TCOR=-0.08,SCOR=0.04,&END
    UCM004    INCLUDES STATIONS  3070 THRU 302R MINUS 3080,3090 AND 3140.
STATION 3070 TEMPERATURE HEADER                                          0
&DAT ISTA=307,AMONC='0',IDEPTH=99,IDSCL=1,ICODE=0,ITSCL=4,ISCL=3,IP=0,
DH=0.0,TH=11.24,SH=33.40,IH=1,&END
STATION 3070 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3070 TEMPERATURE HEADER                                          0
&DAT IDEPTH=99,ITSCL=3&END
STATION 3070 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3070 TEMPERATURE HEADER                                          0
&DAT IDEPTH=99,IDSCL=2&END
STATION 3070 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3070 TEMPERATURE HEADER                                          0
&DAT IDEPTH=99,ITSCL=2&END
STATION 3070 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3070 SALINITY HEADER                                             0
&DAT IDSCL=1,IDEPTH=99,ICODE=1,ITSCL=4,&END
STATION 3070 SALINITY TRACE                                              0
&DAT  IDEPTH=00&END
STATION 3070 SALINITY HEADER                                             0
&DAT IDSCL=2,IDEPTH=99,IP=1,&END
STATION 3070 SALINITY TRACE                                              0
&DAT  IDEPTH=00&END
STATION 3080 TEMPERATURE HEADER                                          0
&DAT ISTA=308,AMONC='0',IDEPTH=99,IDSCL=1,ICODE=0,ITSCL=4,ISCL=3,IP=0,&END
STATION 3080 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3080 TEMPERATURE HEADER                                          0
&DAT IDEPTH=99,ITSCL=3,&END
STATION 3080 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3080 TEMPERATURE HEADER                                          0
&DAT IDEPTH=99,IDSCL=2&END
STATION 3080 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3080 TEMPERATURE HEADER                                          0
&DAT IDEPTH=99,ITSCL=2&END
STATION 3080 TEMPERATURE TRACE
&DAT  IDEPTH=00&END
STATION 3080 SALINITY HEADER                                             0
&DAT IDSCL=1,IDEPTH=99,ICODE=1,ITSCL=4,&END
STATION 3080 SALINITY TRACE                                              0
&DAT  IDEPTH=00&END
STATION 3080 SALINITY HEADER                                             0
```

```
 &DAT IDSCL=2,IDEPTH=99,IP=1,&END
 STATION 3080 SALINITY TRACE                                                  0
 &DAT  IDEPTH=00&END
 STATION END                                                                  1
C (END OF FILE)
C
C
C DECK SET-UP     THE FOLLOWING IS AN EXAMPLE OF JOB CONTROL LANGUAGE
C                 AND DECK SET-UP REQUIRED TO USE DIGISTD. THIS
C                 PARTICULAR DECK SET-UP WAS USED TO WRITE FILE 6 ON
C                 9-TRACK TAPE, NPS-527. THE 9-TRACK TAPE WAS WRITTEN AT
C                 800 BPI WITH A LRECL OF 40 AND BLKSIZE OF 32,520.
C                 HINDSIGHT INDICATES THAT IT IS DESIRABLE TO WRITE
C                 THE TAPE AT A BLKSIZE OF 8000 VICE 32,520 SINCE IT IS
C                 EXTREMELY ADVANTAGEOUS TO KEEP FOLLOW ON TAPE
C                 PROCESSING PROGRAMS SMALL (IE LESS THAN 100K).
C
C
//GUCMSTD6 JOB (2006,0823,OS42),' RE GREER SMC 1413',TIME=10,
//     TYPRUN=HOLD,
//     MSGCLASS=O
// EXEC FORTCLG,REGION.FORT=150K,REGION.GO=350K,DEST=O
//FORT.SYSIN DD *
C       ( MAIN SOURCE DECK AND SUBROUTINES)
//GO.FT06F001 DD SPACE=(CYL,(40,03)),SYSOUT=O
//GO.FT07F001 DD DUMMY
//GO.FT08F001 DD UNIT=3400-4,VOL=SER=NPS527,LABEL=(06,SL,,OUT),
//   DISP=(NEW,KEEP),DCB=(DEN=2,RECFM=FB,LRECL=40,BLKSIZE=32520),
//   DSN=S2006.UCM7374
//GO.METTAP DD UNIT=2400-1,VOL=SER=UCM004,DISP=OLD,LABEL=(,NL),
//        DCB=(DEN=1,TRTCH=ET)
//GO.SYSIN DD *
C       (DATA DECK)
C (END OF FILE)
```

```
C
C MAIN PROGRAM
C
C
C      ********************  D I G I S T D  ***************************        5
C                                                                               10
C                                                                               15
       DIMENSION X(4001), Y(4001), LABEL(19), SH(50), TH(50), DH(50),           20
      1INTA(10), INSA(10), NRCSKP(99), DCON(3), CORRS(7), CORRT(7),             25
      2IREC(1801), AMONCA(13), EVENT(13)                                        30
       INTEGER B(8001),ZER,DOL,STAR,ONE,FLAG,DLTREC,ZERO,DLR,BLANK,GCRD,        35
      1A(2001),TWO,THREE,FOUR,FIVE,SIX,SEVEN,EIGHT,TEN,ELEVEN,AMONT,FG          40
       LOGICAL PRT1,PRT2,PLT1,PLT2,TAPE,ENDFL,CARDS,SKIP,GCARDS                 45
       COMMON /C1/ T(1801),S(1801),D(1801),SV(1801),SIG(1801),                  50
      1SI(1801),T1(1801),D2(1801),S2(1801),T2(1801)                             51
       REAL *8EVENT,WMONTH                                                      52
       DATA AMONCA/'H','I','C','K','L','O','P','Q','R','U','V','W','Z'/        53
       DATA EVENT/'AUG 1973','SEP 1973','OCT 1973','NOV 1973','DEC 1973',       54
      1'JAN 1974','FEB 1974','MAR 1974','APR 1974','MAY 1974','JUN 1974',       55
      2'JUL 1974','AUG 1974'/                                                   56
C      ***************************************************************          60
C                                                                               65
       NAMELIST /CONTRL/ NN,PRT1,PRT2,PLT1,PLT2,TAPE,ENDFL,CARDS,ISTOP,IP       70
      1,IH,NRCSKP,NSKP,JSKIP,JREC,ISQZ,ICSQZ,IGSQZ,GCARDS,TCOR,SCOR             75
      2/DAT/SH,TH,DH,IH,ICODE,ISCL,ITSCL,IDSCL,IP,IDEPTH,ISQZ,IGSQZ,ICSQZ       80
      3,SCOR,TCOR,IHDR,NOIRG,ISTA,TCON,SCON,DCON,CORD,SKIP,CORRS,CORRT,          85
      4AMONC,TAPE,CARDS,GCARDS                                                  90
C
C      ***************************************************************          95
C      ************************ DEFINE SYMBOLS ************************         100
C
C      DEFINE SYMBOLS,NOTING THAT THE LEFT THREE HEX BYTES IN EACH              105
C      ELEMENT OF B END UP FILLED WITH BLANKS                                   110
       DATA DOL/'$$$$'/,STAR/Z4040405C/,KEY/Z4040405F/,ONE/Z404040F1/,          115
      1FLAG/Z40404050/,DLTREC/Z40404060/,MINUS/Z40404061/,                      120
      2 DLR/Z4040405B/,BLANK/'    '/,ZER/Z404040F0/,TWO/Z404040F2/,             125
      3THREE/Z404040F3/,FOUR/Z404040F4/,FIVE/Z404040F5/,                        130
      4MTWO/Z404040E2/,MTHREE/Z404040E3/,MFOUR/Z404040E4/,MFIVE/Z404040E5       135
      5/,SIX/Z404040F6/,SEVEN/Z404040F7/,EIGHT/Z404040F8/,NINE/Z404040F9        140
      6/,TEN/Z404040F0/,ELEVEN/Z4040407B/                                       145
C
C      ***************************************************************          150
C      ********************** DEFINE CONSTANTS ************************         155
C
C      THE FOLLOWING CONVERSION FACTORS ARE IN HUNDREDTHS OF INCHES PER         160
C      UNIT OF S OR T.  THEY MAY BE OVERRIDDEN BY THE DATA CARDS.               165
       DCON(1) = 3.153                                                          170
       DCON(2) = 1.261                                                          175
```

```
      DCON(3) = 0.631                                                   180
      TCON = 189.680                                                    185
      SCON = 474.200                                                    190
C
CC     ***************************************************************  195
CC     ************** INITIALIZE ALL TERMS AND VARIABLES **************  200
C                                                                       205
      DATA CARDS/.FALSE./,CORD/0.0/,ENDFL/.FALSE./,FG/0/,GCARDS/.FALSE./ 210
     1,ICODE/0/,ICSQZ/1/,IGSQZ/1/,IH/0/,IHDR/0/,IP/0/,IPS/8000/,ISCL/0/, 215
     2IDEPTH/1/,IDSCL/0/,ISTA/999/,ITSCL/0/,                            220
     3ISQZ/1/,ISTOP/0/,JJJ/0/,JJJJ/0/,JREC/0/,JSAV/0/,KBARF/0/,KSCARF/0/ 225
     4,KDTAF/1/,KDTA/1/,KDT1/1/,KDTH1/1/,KDTH2/1/,KS/1/,KS1/1/,         230
     5KS2/1/,KT/1/,KT1/1/,KT2/1/,NE/0/,NOIRG/0/,NSKP/0/,PLT1/.FALSE./,  235
     6PLT2/.FALSE./,PRT1/.TRUE./,PRT2/.FALSE./,SCOR/0.0/,SKIP/.FALSE./, 240
     7TAPE/.FALSE./,TCOR/0.0/                                           245
C
CC     ***************************************************************  250
CC     ******************** INITIALIZE ALL ARRAYS ********************  255
CC                                                                      260
CC     GIVE THE ARRAYS INITIAL VALUES                                   265
CCC                                                                     270
C                                                                       275
      DO 20 J=1,50                                                      280
      SH(J) = 0.0                                                       285
      TH(J) =-5.0                                                       290
      DH(J) = 0.0                                                       295
   20 CONTINUE                                                          300
C                                                                       305
CC                                                                      310
CCC                                                                     315
C                                                                       320
      DO 30 J=1,1801                                                    325
      D(J) = 0.0                                                        330
      T(J) =-5.0                                                        335
      S(J) = 0.0                                                        340
      D2(J) = 0.0                                                       345
      T2(J) =-5.0                                                       350
      S2(J) = 0.0                                                       355
      T1(J) =-5.0                                                       360
      S1(J) = 0.0                                                       365
      IREC(J) = 0                                                       370
   30 CONTINUE                                                          375
C                                                                       380
CC                                                                      385
CCC                                                                     390
C                                                                       395
      DO 40 J=1,99                                                      400
      NRCSKP(J) = 0                                                     405
```

```
   40 CONTINUE                                                          410
C                                                                       415
CC                                                                      420
CC                                                                      425
C                                                                       430
      DO 50 J=1,7,1                                                     435
      CORRS(J) = 0.0                                                    440
      CORRT(J) = 0.0                                                    445
   50 CONTINUE                                                          450
C                                                                       455
CC                                                                      460
CC       PROVIDE INITIAL INDICES FOR 10 SALINITY SEGMENTS (INSA) AND 10 465
C        TEMPERATURE SEGMENTS (INTA).                                   470
      INSA(1) = 1                                                       475
      INSA(2) = 1                                                       480
      INTA(1) = 1                                                       485
      INTA(2) = 1                                                       490
C                                                                       500
      DO 60 J=3,10                                                      505
      INSA(J) = 980                                                     510
      INTA(J) = 980                                                     515
   60 CONTINUE                                                          520
C                                                                       525
CC       COMPUTE A TABLE OF CONVERSION FACTORS FOR SALINITY AND         535
C        TEMPERATURE. CORRS AND CORRT REPRESENT THE S OR T VALUE AT THE 540
C        LEFT HAND SIDE OF THE STD TRACE. THE VALUE (J) TO BE USED WILL 545
C        COME FROM ISCL AND ITSCL. HYTECH STD MODEL 9006 STANDARD       550
C        TEMPERATURE AND SALINITY SCALES 1 THRU 7 ARE PROVIDED FOR IN   555
C        THIS PROGRAM IN ADDITION TO DEPTH SCALES 1,2, AND 3. FOR       560
C        CONVENIENCE THE SCALES FOR TEMPERATURE, SALINITY, AND DEPTH ARE 565
C        DEFINED HERE.                                                  570
C     TEMPERATURE SCALES:                                               575
C        ITSCL 1= -2 TO 3  (DEG CELSIUS)                                580
C        ITSCL 2=  2 TO 7  (DEG CELSIUS)                                585
C        ITSCL 3=  6 TO 11 (DEG CELSIUS)                                590
C        ITSCL 4= 10 TO 15 (DEG CELSIUS)                                595
C        ITSCL 5= 14 TO 19 (DEG CELSIUS)                                600
C        ITSCL 6= 18 TO 23 (DEG CELSIUS)                                605
C        ITSCL 7= 22 TO 27 (DEG CELSIUS)                                610
C     SALINITY SCALES:                                                  615
C        ISCL  1= 30.0 TO 32.0  (PPT)                                   620
C        ISCL  2= 31.5 TO 33.5  (PPT)                                   625
C        ISCL  3= 33.0 TO 35.0  (PPT)                                   630
C        ISCL  4= 34.5 TO 36.5  (PPT)                                   635
C        ISCL  5= 36.0 TO 38.0  (PPT)                                   640
C        ISCL  6= 37.5 TO 39.5  (PPT)                                   645
C        ISCL  7= 30.0 TO 40.0  (PPT)                                   650
C     DEPTH SCALES:                                                     655
```

```
C         DCON(1)=  0.0 TO 300.0  (METERS)                                    660
C         DCON(2)=  0.0 TO 750.0  (METERS)                                    665
C         DCON(3)=  0.0 TO 1500.0 (METERS)                                    670
C                                                                             675
      CORRT(7) = 22.0                                                         680
      CORRS(7) = 30.0                                                         685
C                                                                             690
C                                                                             695
      DO 70 J=1,6,1                                                           700
      FJ = J                                                                  705
      CORRT(J) = -2.0+(FJ-1.0)*4.0                                            710
      CORRS(J) = 30.0+(FJ-1.0)*1.5                                            715
   70 CONTINUE                                                                720
C                                                                             725
CC                                                                            730
CC                                                                            735
C      ************************************************************           740
C      ***** BEGIN PROCESSING; READ INITIAL DATA FROM TWO CARDS ********      745
C      PROGRAM PROVIDES FOR READING NSKP RECORDS WITHOUT PROCESSING.          750
C      NSKP, AS WELL THE 99 VALUES OF NRCSKP MUST BE ON THE FIRST             755
C      CONTRL CARD. A SINGLE CONTRL CARD IS READ HERE TO SET NSKP AND         760
C      NRCSKP. THERE ALSO MAY BE AN INFORMATIVE LABEL EXPLAINING HOW          765
C      MANY AND WHICH RECORDS SKIPPED.                                        770
      READ (5,CONTRL)                                                         775
      READ (5,170) LABEL                                                      780
      WRITE (6,180) LABEL                                                     785
C                                                                             790
C      IF TAPE=.TRUE., TAPE MUST BE REWOUND AND APPROPRIATE JCL MUST          795
C      BE PROVIDED TO DEFINE IT. SEE JCL FOR EXAMPLE IN PRECEDING             800
C      PROGRAM DOCUMENTATION SECTION.                                         805
      IF (TAPE) REWIND 8                                                      810
      IF (NSKP.EQ.0) GO TO 140                                                815
C                                                                             820
C      ************************************************************           825
C      ************************ START SKIP LOOP *********************          830
CC                                                                            835
C                                                                             840
      DO 80 IS=1,NSKP                                                         845
      IIS = IS                                                                850
C                                                                             855
C      THE VARIABLE,IPS, IS SET NEGATIVE DURING THE RECORD SKIP PROCESS.      860
C      THIS AVOIDS TPRD STOPPING ON UNREADABLE OR BAD RECORDS. NO DATA        865
C      CARDS ARE REQUIRED FOR INITIALLY SKIPPED RECORDS.                      870
C      IMPORTANT NOTE:  INITIALLY SKIPPED RECORDS (NSKP) DIFFER FROM          875
C      INDIVIDUALLY SKIPPED RECORDS (NRCSKP) IN THAT NRCSKP REQUIRES          880
C      DATA CARDS AND PERMITS 99 INDIVIDUAL RECORDS TO BE SKIPPED WHILE       885
C      NSKP DOES NOT REQUIRE DATA CARDS AND PERMITS MULTIPLE RECORDS TO       890
C      BE SKIPPED. (IE. NSKP=40, THE FIRST 40 RECORDS ON THE TAPE BEING       895
```

```
C       READ WILL BE SKIPPED; WHEREAS NRCSKP=22,23,24,50 PERMITS RECORD          900
CC      NUMBERS 22,23,24,50 TO BE SKIPPED INDIVIDUALLY.)                        905
C                                                                               910
      IPS = -8000                                                               915
   80 CALL TPRD (A,IPS,&100,&120)                                               920
C                                                                               925
CC                                                                              930
CCC                                                                             935
C       ********************************************************************    940
C       ********** RESET IPS FOR NORMAL TAPE PROCESSING ***********            945
      IPS = 8000                                                                950
      WRITE (6,90) IIS                                                          955
   90 FORMAT (/5X,I5,' RECORDS SKIPPED'/)                                       960
      GO TO 140                                                                 965
C                                                                               970
CC      IF END OR  ERROR MESSAGES OCCUR DURING SKIP ROUTINE, PROGRAM            975
C       STOPS.                                                                  980
  100 WRITE (6,110) IIS                                                         985
  110 FORMAT (/5X,'FOUND END OF FILE ON RECORD',I4,'DURING SKIP PROCESS'        990
     1 /)                                                                       995
      GO TO 1580                                                               1000
  120 WRITE (6,130) IIS,A(1),A(2),A(3),A(4)                                    1005
  130 FORMAT (/5X,'READ ERROR ON RECORD',I5,'ERROR STATISTICS ARE: ',4Z8        1010
     1)                                                                        1015
      GO TO 1580                                                               1020
C       ********************************************************************   1025
CC      ********************** END SKIP LOOP **********************            1030
CC                                                                             1035
C     REDEFINE LOOP INDEX TO START AT ONE.                                     1040
  140 NNN = NN-NSKP                                                            1045
C                                                                              1050
CC      ********************************************************************   1055
C       ************** START MAIN LOOP FOR EACH RECORD ****************        1060
      IT = 1                                                                   1065
  150 IF (IT.GT.NNN) GO TO 1580                                                1070
      IPS = 8000                                                               1075
      NREC = IT+NSKP                                                           1080
      WRITE (6,160) NREC                                                       1085
  160 FORMAT (/5X,'LABEL  150; START MAIN LOOP.  RECORD NO. ',I3/)             1090
C                                                                              1095
CC      PROGRAM PERMITS TREATMENT OF A KNOWN NUMBER OF RECORDS,NN, OR          1100
CC      STOPPING WHEN ISTOP=1 ON STATION LABEL CARD. THE LABEL CARD HAS        1105
CC      TWO DIGITS FOR CONTROL. THE 77-TH COLUMN IS JSKIP; IF JSKIP=0,         1110
CC      ONLY TWO CARDS ARE READ. THE 78-TH COLUMN IS ISTOP; IF ISTOP=1,        1115
CC      THE PROGRAM STOPS. NORMAL TERMINATION OF THE PROGRAM MAY BE            1120
CC      ACCOMPLISHED IN TWO DISTINCT WAYS. EITHER SET NN TO DESIRED            1125
CC      RECORD TO STOP OR PLACE A 'STATION END' LABEL CARD AT END OF DATA      1130
C       DECK WITH A ONE IN COLUMN 78. THE 79-TH COLUMN IS AMONC; AMONC IS      1135
```

```
C       AN ALPHABETIC LETTER CODE FOR MONTH AND YEAR. THIS CODE IS          1140
C       CONVERTED TO LITERAL MONTH AND YEAR LATER ON IN PROGRAM.            1145
C                                                                           1150
      READ (5,170) LABEL,JSKIP,ISTOP,AMONC                                  1155
  170 FORMAT (19A4,2I1,A1)                                                  1160
      IF (ISTOP.GT.0) GO TO 1580                                            1165
      READ (5,DAT)                                                          1170
      WRITE (6,180) LABEL                                                   1175
      WRITE (6,DAT)                                                         1180
C       NORMALLY TWO CARDS, LABEL AND DAT, ARE READ PER RECORD.             1185
C       LESS FREQUENTLY CHANGED VARIABLES ARE ON CONTRL DATA CARD.          1190
      JJJJ = 0                                                              1195
      NCIRG = 0                                                             1200
      IF (JSKIP.EQ.0) GO TO 190                                             1205
      READ (5,CONTRL)                                                       1210
      WRITE (6,CONTRL)                                                      1215
  180 FORMAT (/5X,19A4/)                                                    1220
C                                                                           1225
C                                                                           1230
C       PROVISION IS MADE HERE FOR A MISSED HEADER LABEL ON TAPE (AN        1235
C       OPERATOR ERROR). IF IHDR=1,AND ALL INFORMATION REQUIRED IS PLACED   1240
C       ON PARTICULAR &DAT CARD, THE PROGRAM BRANCHES OFF TO  610 AND       1245
C       WRITES STATION INFORMATION AND MESSAGE THAT HEADER IS MISSING,      1250
C       AND FINALLY RETURNS TO 150 TO START NORMAL PROCESSING OF TRACE      1255
C       RECORD DATA. NOTE, RECORD COUNT IS NOT INCREMENTED IN THIS LOOP.    1260
C                                                                           1265
  190 IF (IHDR.EQ.1) GO TO 610                                              1270
  200 CONTINUE                                                              1275
C                                                                           1280
C       NOTE: IN EARLIER VERSIONS OF THIS PROGRAM, THERE WAS AN             1285
C       INTERPOLATION ROUTINE HERE FOR HAND-ENTERED DATA BUT IT WAS         1290
C       DELETED SINCE VERY SELDOM ONE HAD CAUSE TO USE IT. HOWEVER, THE     1295
C       CAPABILITY FOR HAND-ENTERED DATA HAS BEEN RETAINED BUT IN A         1300
C       DIFFERENT FORM. SEE COMMENTS FOLLOWING STATEMENT NO. 1130.          1305
C                                                                           
C-------------------                                                        
  210 FORMAT (5X,11F7.2/5X,11F7.2/5X,11F7.2/5X,11F7.2/5X,11F7.2/5X,11F7.    1310
     12/5X,11F7.2/5X,11F7.2/5X,3F7.2,60X,I6)                                1315
  220 FORMAT (5X,10I5,'  INSA')                                             1320
  230 FORMAT (5X,10I5,'  INTA')                                             1325
  240 FORMAT (5X,' KS , KS1, KS2, KT , KT1, KT2, JJJ, NE ,KDTH1,KDTH2,KD    1330
     1TA,KDT1,JJJJ'/4X,8I5,2I6,3I5)                                        1335
C-------------------                                                        1340
C                                                                           1345
C-------------------                                                        1350
      IPLACE=245                                                            
      WRITE (6,210) (D(J),J=1,1801,20)                                      1360
      WRITE (6,210) (T(J),J=1,1801,20),IPLACE                               1365
```

```
      WRITE (6,210) (S(J),J=1,1801,20),IPLACE                                1370
      WRITE (6,220) (INSA(J),J=1,10)                                         1375
      WRITE (6,230) (INTA(J),J=1,10)                                         1380
      WRITE (6,240) KS,KS1,KS2,KT,KT1,KT2,JJJ,NE,KDTH1,KDTH2,KDTA,KDT1,J    1385
     1JJJ                                                                    1390
C---------------------                                                       1395
C                                                                            1400
C                                                                            1405
C       FILL THE A ARRAY WITH DOLLARS                                        1410
C                                                                            1415
C                                                                            1420
      DO 250 I=1,2001                                                        1425
C      THE 2001 ASSURES THAT THE LAST WORD OF A WILL CONTAIN DOLLARS         1430
C      SINCE 2000 WORDS OR 8000 BYTES OF DATA ARE READ IN.                   1435
      A(I) = DOL                                                             1440
  250 CONTINUE                                                               1445
C                                                                            1450
C                                                                            1455
C       FILL B WITH BLANKS                                                   1460
C                                                                            1465
C                                                                            1470
      DO 260 I=1,8000                                                        1475
      B(I) = BLANK                                                           1480
  260 CONTINUE                                                               1485
C                                                                            1490
C       PROGRAM EXAMINES LIST OF INDIVIDUAL BAD RECORDS,NRCSKP,AND           1495
C       SKIPS THEM. IF NRCSKP(1)=0, THE SKIP ROUTINE IS BY-PASSED.           1500
C       CAUTION:  DO NOT REMOVE PAIRS OF DATA CARDS FOR INDIVIDUALLY         1505
C       SKIPPED CARDS.                                                       1510
C                                                                            1515
C       IN USING THE CALMA DIGITIZER, SPURIOUS BLANK RECORDS OCCURRED        1520
C       THROUGHOUT THE TAPE ON NUMEROUS OCCASSIONS. MANY OF THESE            1525
C       OCCURRENCES WERE LATER TRACED TO EQUIPMENT MALFUNCTION.              1530
C       HOWEVER, IF A BLANK RECORD OCCURS DURING A HEADER LABEL RECORD       1535
C       NOTHING IS LOST SINCE HEADER INFO MAY BE INSERTED BY CARD AND        1540
C       SETTING IHDR=1. ON THE OTHER HAND, IF A BLANK RECORD OCCURS          1545
C       DURING A TRACE RECORD THE COMPLETE STATION IS LOST. FROM             1550
C       EXPERIENCE, A BLANK RECORD WILL GENERALLY HAVE TWO CHARACTERS.       1555
C       AFTER THE FIRST PROGRAM RUN AND A DETERMINATION OF BLANK OR          1560
C       BAD RECORDS HAS BEEN MADE, THESE MAY BE SKIPPED INDIVIDUALLY VIA     1565
C       NRCSKP ROUTINE.                                                      1570
      IF (NRCSKP(1).EQ.0) GO TO 320                                          1575
C                                                                            
C       ********************************************************************1580
C       ********** START INDIVIDUAL RECORD SKIP LOOP **********             1585
C                                                                            1590
C                                                                            1595
```

```
      DO 270 LB=1,99                                                    1600
      NRC = NRCSKP(LB)-NSKP                                             1605
      IF (NRC.EQ.IT) GO TO 280                                          1610
  270 CONTINUE                                                          1615
C                                                                       1620
      GO TO 300                                                         1625
  280 IPS = -8000                                                       1630
  290 FORMAT (//5X,'LABEL 290. RECORD NO.',I5,' SKIPPED VIA NRCSKP SKIP 1635
     1 ROUTINE.'//)                                                     1640
      WRITE (6,290) IT                                                  1645
C     CHANGING IPS TO NEGATIVE CAUSES TPRD  TO SKIP A RECORD            1650
  300 IF (ICODE.EQ.0) GO TO 320                                         1655
      WRITE (6,310) IDEPTH,ICODE,ISCL                                   1660
  310 FORMAT (5X,'SALINITY VERSUS DEPTH'/                               1665
     1 5X,'STD RECORD STARTS AT ',I3,' METERS'/                         1670
     2 5X,'CODE =  ',I2/                                                1675
     3 5X,'SCALE = ',I2/)                                               1680
C                                                                       1685
CC     ************************************************************   1690
C      ********************** READ TAPE ***************************   1695
  320 CALL TPRD (A,IPS,&350,&330)                                       1700
C                                                                       1705
C      IPS IS THE MAXIMUM NUMBER OF BYTES OF DATA WHICH WILL BE READ    1710
C      FROM ONE RECORD OF DIGITIZER TAPE BY TPRD. IPS/2 IS THE MAXIMUM  1715
C      TOTAL TRAVEL ALONG THE CURVE MEASURED IN 0.01 INCHES IN THE X    1720
C      AND Y DIRECTION SEPARATELY. 350 IS THE END OF FILE EXIT, AND 330 1725
C      IS THE READ-ERROR EXIT.                                          1726
      GO TO 360                                                         1730
  330 WRITE (6,340) A(1),A(2),A(3),A(4)                                 1735
  340 FORMAT (5X,'110 ERROR STATISTICS TABLE IS ',4Z8)                   1740
C                                                                       1745
  350 CONTINUE                                                          1750
  360 CONTINUE                                                          1755
C                                                                       1760
CC     ************************************************************   1765
C      ***************** END INDIVIDUAL RECORD SKIP LOOP ***************  1770
C                                                                       1775
C      PROCESS THE LAST RECORD                                          1780
C      MOVE THE BYTES OF A INTO THE 4-BYTE WORDS OF B USING CHMOVE.     1785
      JJ = 0                                                            1790
      JJJ = 0                                                           1795
C                                                                       1800
C                                                                       1805
      DO 370 II=1,2000                                                  1810
C                                                                       1815
C                                                                       1820
      DO 370 I=1,4                                                      1825
      JJ = JJ+1                                                         1830
```

```
      CALL CHMOVE (A(II),I,B(JJ),4)                                          1835
      IF (B(JJ).EQ.DLR) GO TO 380                                            1840
C      END OF DATA DETECTED                                                  1845
C      THERE MAY BE A STAR BEFORE THE DOLLAR                                 1850
  370 CONTINUE                                                               1855
C                                                                            1860
C                                                                            1865
  380 CONTINUE                                                               1870
      B(8001) = DLR                                                          1875
C                                                                            1880
CC     ************************************************************          1885
CC     ***************** PREPARE TO PROCESS RAW ARRAY ******************      1890
C                                                                            1895
      WRITE (6,390) JJ,(B(J),J=1,25)                                         1900
  390 FORMAT (/5X,'LABEL 390.  ARRAY B IS FILLED; LOOK FOR MODE CHARACTE     1905
     1R.  THE NUMBER OF ARRAY ELEMENTS PROCESSED INCLUDING STARS AND '/      1910
     2 5X,'DOLLARS, JJ= ',I5,/5X,'FIRST  25 CHARACTERS ARE: ',               1915
     3 10(1X,Z8)/5X,10(1X,Z8)/5X,5(1X,Z8)/)                                 1920
C                                                                            1925
CC     ************************************************************          1930
C                                                                            1935
      JJ = 1                                                                 1940
      GO TO 430                                                              1945
C                                                                            1950
CC     ********************************************************************  1955
CC     ******************** START MISSING IRG ROUTINE *********************  1960
CC                                                                           1965
CC     THE FOLLOWING ROUTINE READS ANOTHER SET OF CARDS.  THIS IS THE        1970
C      ENTRY FOR THE SITUATIONS IN WHICH THE IRG IS MISSED.                  1975
  400 READ (5,170) LABEL,JSKIP,ISTOP,AMONC                                   1980
      IF (ISTOP.GT.0) GO TO 1580                                             1985
      IF (JSKIP.EQ.0) GO TO 410                                              1990
      READ (5,DAT)                                                           1995
      WRITE (6,180) LABEL                                                    2000
      WRITE (6,DAT)                                                          2005
      READ (5,CONTRL)                                                        2010
      WRITE (6,CONTRL)                                                       2015
C--------------------                                                        2020
  410 IPLACE=410                                                             2025
      WRITE (6,210) (D(J),J=1,1801,20)                                       2030
      WRITE (6,210) (T(J),J=1,1801,20),IPLACE                                2035
      WRITE (6,210) (S(J),J=1,1801,20),IPLACE                                2040
      WRITE (6,220) (INSA(J),J=1,10)                                         2045
      WRITE (6,230) (INTA(J),J=1,10)                                         2050
      WRITE (6,240) KS,KS1,KS2,KT,KT1,KT2,JJJ,NE,KDTH1,KDTH2,KDTA,KDT1,J    2055
     1JJJ                                                                    2060
      WRITE (6,420) NOIRG,JJJJ                                               2065
  420 FORMAT (/5X,'LABEL 410.  PROCESSING SECOND HALF.  NOIRG=',I3,          2070
```

```
     1 'JJJJ=',I5/)                                                          2060
C-----------------------
      NOIRG = 0                                                              2065
      JJ = JJJJ                                                              2070
C                                                                            2075
C      ***************************************************************       2080
C      ********************END MISSING IRG ROUTINE ********************       2085
C                                                                            2090
C      INITIALIZE ADDERS,ETC.                                                2095
  430 SUMD = 0.                                                              2100
      SUMD = 0.                                                              2105
      SUMT = 0.                                                              2110
      N = 0                                                                  2115
      KL = 0                                                                 2120
      KK = 0                                                                 2125
C                                                                            2130
C      ***************************************************************       2135
C      ************************ MODE SYMBOL CHECK ***********************       2140
C                                                                            2145
  440 IF (B(JJ).EQ.KEY) GO TO 490                                            2150
C      THE FIRST ELEVEN VALUES OF THE B-ARRAY ARE CHECKED FOR A              2155
C      KEYBOARD SYMBOL SINCE IT IS POSSIBLE TO HAVE GARBAGE VALUES AHEAD     2160
C      OF THE KEYBOARD SYMBOL. IF ALL ELEVEN VALUES ARE NOT KEYS             2165
C      THEN JJ IS RESET TO 1 AND THE RECORD IS PROCESSED AS A TRACE.         2170
C      HOWEVER, IF ONE OF THE ELEVEN VALUES ARE A KEY, PROGRAM BRANCHES      2175
C      TO 490, AND PROCESSES AS A HEADER. AT FIRST GLANCE, THIS              2180
C      PROCEDURE APPEARS TO ASSUME THAT IT IS IMPOSSIBLE TO HAVE A           2185
C      KEY SYMBOL APPEAR IN THE FIRST ELEVEN CHARACTERS OF A TRACE           2190
C      RECORD. THIS IS NOT A BAD ASSUMPTION SINCE THE OPERATOR HAS TO        2195
C      GO OUT OF HIS WAY TO INITIATE KEYBOARD MODE DURING TRACE MODE.        2200
C      HOWEVER, LEAVING NOTHING TO CHANCE THE PROGRAM WILL KEEP              2205
C      CHECKING FOR KEY OR TRACER UNTIL OPERATOR MAKES UP HIS MIND           2210
C      WHICH MODE IS CORRECT. IF NO TRACER SYMBOLS APPEAR AFTER PROGRAM      2215
C      FINDS A KEY, THEN RECORD WILL BE PROCESSED AS A HEADER. ON THE        2220
C      OTHER HAND, IF NO KEY SYMBOLS APPEAR AFTER PROGRAM FINDS A TRACER     2225
C      THEN THE RECORD WILL BE PROCESSED AS A TRACE.                         2230
      JJ = JJ+1                                                              2235
      IF (B(JJ).EQ.KEY) GO TO 490                                            2240
      JJ = JJ+1                                                              2245
      IF (B(JJ).EQ.KEY) GO TO 490                                            2250
      JJ = JJ+1                                                              2255
      IF (B(JJ).EQ.KEY) GO TO 490                                            2260
      JJ = JJ+1                                                              2265
      IF (B(JJ).EQ.KEY) GO TO 490                                            2270
      JJ = JJ+1                                                              2275
      IF (B(JJ).EQ.KEY) GO TO 490                                            2280
      JJ = JJ+1                                                              2285
      IF (B(JJ).EQ.KEY) GO TO 490                                            2290
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```
      JJ = JJ+1                                                          2295
      IF (B(JJ).EQ.KEY) GO TO 490                                        2300
      JJ = JJ+1                                                          2305
      IF (B(JJ).EQ.KEY) GO TO 490                                        2310
      JJ = JJ+1                                                          2315
      IF (B(JJ).EQ.KEY) GO TO 490                                        2320
      JJ = JJ+1                                                          2325
      IF (B(JJ).EQ.KEY) GO TO 490                                        2330
      JJ = JJ-10                                                         2335
      IF (KL.EQ.1) GO TO 500                                             2340
      IF (KL.EQ.2) GO TO 500                                             2345
C      NO KEYBOARD SYMBOL; MAY HAVE FORGOTTEN IT. TEST THE 5TH AND       2350
C      6TH SYMBOLS (IDEPTH).  IF BOTH ARE NINES CALL IT A KEYBOARD.      2355
      IF (B(5).EQ.NINE.AND.B(6).EQ.NINE) GO TO 450                       2360
      GO TO 670                                                          2365
  450 IJJ = JJ+12                                                        2370
      WRITE (6,460) (B(I),I=JJ,IJJ)                                      2375
  460 FORMAT (/5X,'AT 450, MISSING KEY.  B(1) TO B(13)=',13A1/)          2380
      GO TO 500                                                          2385
C                                                                        2390
  470 WRITE (6.480)                                                      2395
  480 FORMAT (5X,'FOUND EIGHT KEYBOARD SYMBOLS IN SEQUENCE.   STOP.')    2400
      GO TO 1570                                                         2405
  490 KL = KL+1                                                          2410
      JJ = JJ+1                                                          2415
C      A CHECK IS MADE HERE FOR MULTIPLE KEYBOARD SYMBOLS. IF NUMBER     2420
C      EXCEEDS EIGHT, PROGRAM TERMINATES. THE NUMBER EIGHT IS ARBITRARY  2425
C      BUT ONE WOULD PROBABLY NOT WANT TO USE A NUMBER GREATER THAN 12   2430
C      (IE. ONE LESS THAN NUMBER OF CHARACTERS IN HEADER). EXPERIENCE    2435
C      INDICATES THAT SELDOM DOES ONE INCUR MORE THAN THREE KEYBOARD     2440
C      SYMBOLS ON A TAPE PER RECORD.                                     2445
      IF (KL.EQ.8) GO TO 470                                             2450
      IF (B(JJ).EQ.STAR) GO TO 670                                       2455
C      TRY AGAIN                                                         2460
      GO TO 440                                                          2465
C
C      ********************************************************          2470
C      ********************* START KEYBOARD DECODE *********************2475
C                                                                        2480
C      PROCESS KEYBOARD ENTRIES.  CHANGE THE WORDS TO                    2485
C      INTEGER FORM BY SUBTRACTING Z404040F0 AND CREATE MULTI-DIGIT      2490
C      INTEGERS                                                          2495
C      SKIP=T PERMITS NAMELIST DATA TO OVERRIDE HEADING DATA.  ALL THE   2500
C      HEADING DATA MUST THEN BE ON THE NAMELIST CARDS.                  2505
  500 IF (SKIP) GO TO 610                                                2510
      ISTAA = 0                                                          2515
      IDEPT = 0                                                          2520
C      DEFINE INDICES FOR DECODING THE LABEL                             2525
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```
      KY1 = JJ                                                          2530
      KY2 = KY1+2                                                       2535
      KY3 = KY1+3                                                       2540
      KY4 = KY1+4                                                       2545
      KY5 = KY1+5                                                       2550
      KY6 = KY1+6                                                       2555
      KY7 = KY1+7                                                       2560
      KY8 = KY1+8                                                       2565
      KY9 = KY1+9                                                       2570
      KY10 = KY1+10                                                     2575
      KY11 = KY1+11                                                     2580
C                                                                       2585
C      DLTREC ARE FOUND HERE IN THE HEADER.  IF DLTREC OCCURS , READ IN 2590
C      A NEW RECORD AND USE SAME CARDS.                                 2595
C                                                                       2600
C                                                                       2605
      DO 510 J=KY1,KY10                                                 2610
      IF (B(J).EQ.DLTREC) GO TO 520                                     2615
  510 CONTINUE                                                          2620
C                                                                       2625
C                                                                       2630
      GO TO 550                                                         2635
  520 WRITE (6,530)                                                     2640
  530 FORMAT (/5X,'DLTREC IN HEADER. REPEAT,USING SAME CARDS.'/)        2645
  540 IT = IT+1                                                         2650
      GO TO 200                                                         2655
  550 KT2 = 10                                                          2660
      KS2 = 10                                                          2665
C      THESE TWO STATEMENTS GIVE MAXIMUM VALUES TO KT2 AND KS2 SO THAT  2670
C      THEY WILL ALWAYS BE DEFINED, EVEN IF  ONLY ONE VARIABLE IS TRACED 2675
C                                                                       2680
C      DO THE CONVERSION, COMPARE WITH VALUES READ FROM THE CARDS,ACCEPT 2685
C      THE CARDS.                                                       2690
C                                                                       2695
C                                                                       2700
      DO 560 J=KY1,KY2                                                  2705
      B(J) = B(J)-ZER                                                   2710
      IB = B(J)                                                         2715
      ISTAA = ISTAA+IB*10**(KY2-J)                                      2720
  560 CONTINUE                                                          2725
C                                                                       2730
      AMCNT = B(KY3)                                                    2735
C                                                                       2740
C                                                                       2745
      DO 570 J=KY4,KY5                                                  2750
      B(J) = B(J)-ZER                                                   2755
      IB = B(J)                                                         2760
      IDEPT = IDEPT+IB*10**(J-KY4)                                      2765
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  570 CONTINUE                                                          2770
C                                                                       2775
      IDSC = B(KY6)-ZER                                                 2780
      ICOD = B(KY7)-ZER                                                 2785
      ITSCL1 = B(KY8)-ZER                                               2790
      ISCL1 = B(KY9)-ZER                                                2795
      IPP = B(KY10)-ZER                                                 2800
C                                                                       2805
C       IF THERE IS A DISAGREEMENT, WRITE A MESSAGE.                    2810
      IF (ISTAA.NE.ISTA) GO TO 590                                      2815
      IF (IDEPT.NE.IDEPTH) GO TO 590                                    2820
      IF (IDSC.NE.IDSCL) GO TO 590                                      2825
      IF (ICOD.NE.ICODE) GO TO 590                                      2830
      IF (ITSCL1.NE.ITSCL) GO TO 590                                    2835
      IF (ISCL1.NE.ISCL) GO TO 590                                      2840
      IF (IPP.NE.IP) GO TO 590                                          2845
  580 FORMAT (5X,'LABEL= 580.  CARD INPUTS EQUALLED TAPE HEADER FOR     2850
     1 STATION ',I3,A1/5X,'IDEPTH= ',I3/)                               2855
      WRITE (6,580) ISTA,AMONC,IDEPTH                                   2860
      GO TO 610                                                         2865
  590 WRITE (6,600) ISTA,AMONC,IDEPTH,IDSCL,ICODE,ITSCL,ISCL,IP,ISTAA,AM  2870
     1ONT,IDEPT,IDSC,ICOD,ITSCL1,ISCL1,IPP                              2875
  600 FORMAT (/3X'CARD AND TAPE DISAGREE, CARD ON TOP'/3X,'   ISTA  AMON  2880
     1C   IDEPTH  IDSCL  ICODE  ITSCL   ISCL    IP'/3X,I7,A7,6I7/3X,I7   2885
     2 ,A7,6I7/)                                                        2890
C       WRITE THE RESULTS                                               2895
  610 WRITE (6,620) ISTA,AMONC,IDEPTH                                   2900
  620 FORMAT (5X,'LABEL 610.  HEADER PROCESSING COMPLETE EXCEPT SEARCH F  2905
     1OR ERRORS ON STATION ',I3,A1/5X,'IDEPTH= ',I3/)                   2910
C                                                                       2915
C                                                                       2920
C       IT IS POSSIBLE THAT NO IRG EXISTS AFTER THE HEADER.IF SO,       2925
C       THE PROGRAM HAS FILLED THE B ARRAY WITH BOTH THE HEADER AND TEMP.  2930
C       OR SALINITY TRACE. ASSUME THERE IS A TRACER SYMBOL IN POSITION  2935
C       12. IF SO, CONTINUE TO PROCESS THE B-ARRAY                      2940
      IF (B(KY11).NE.STAR) GO TO 640                                    2945
      JJJJ = KY11                                                       2950
      WRITE (6,630)                                                     2955
  630 FORMAT (/5X,'NO IRG AFTER HEADER; CONTINUE TO PROCESS B ARRAY.'/)  2960
      GO TO 400                                                         2965
  640 IF (IHDR.EQ.0) GO TO 660                                          2970
C                                                                       2975
C       THIS BRANCH RETURNS TO 150 IF MISSED HEADER AND IHDR SET EQUAL 1.  2980
      WRITE (6,650)                                                     2985
  650 FORMAT (/5X,'HEADER MISSING; INFO INSERTED WITH CARDS.'/)          2990
      IHDR = 0                                                          2995
      GO TO 150                                                         3000
  660 CONTINUE                                                          3005
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      GO TO 1550                                                        3010
C      ************************************************************     3015
C      ********************* END KEYBOARD DECODE *********************     3020
C                                                                       3025
C                                                                       3030
C      ************************************************************     3035
C      ***************** START OF NORMAL TRACE PROCESSING *************     3040
C                                                                       3045
C      THE FOLLOWING PROCEDURE PERMITS THE PRESENCE OF ANY REASONABLE    3050
C      NUMBER OF TRACER SYMBOLS (STAR) INCLUDING NONE.                  3055
  670 NE = 0                                                            3060
      NF = 0                                                            3065
      NSTAR = 0                                                         3070
  680 IF (B(JJ).EQ.STAR) GO TO 700                                      3075
C                                                                       3080
C      COUNT STARS AND WRITE MESSAGE                                    3085
      WRITE (6,690) NSTAR                                               3090
  690 FORMAT (/5X,'START TRACER MODE; NO. OF TRACER SYMBOLS =',I2/)      3095
C      WHEN THERE ARE NO MORE STARS, START TESTING FOR COUNT SYMBOLS ETC 3100
      GO TO 710                                                         3105
  700 JJ = JJ+1                                                         3110
      NSTAR = NSTAR+1                                                   3115
C      WE CONTINUE TO TEST FOR STARS UNTIL NO MORE APPEAR.              3120
      GO TO 680                                                         3125
C                                                                       3130
C      THE NEXT BLOCK OF OPERATIONS TO STATEMENT NO. 950 LOOPS BACK TO  3135
C      710 CONTINUALLY, TESTING EACH CHARACTER FOR IDENTITY AND         3140
C      CONTINUING TO ADD OR SUBTRACT FROM THE CUMULATIVE Y AND X COUNTS 3145
C      UNTIL A DELETE-RECORD SYMBOL OR A STAR OR A DOLLAR INDICATES     3150
C      THE END OF DATA.  THE FLAG IS PLACED AT THE POINT WHERE THE TRACE3155
C      ENTERS THE CROSS-SECTIONED AREA; PREVIOUS COUNTS RESULT FROM THE 3160
C      TRACER TRAVELLING FROM THE COORDINATE ZERO TO THIS POINT.        3165
  710 IF (B(JJ).EQ.ONE) GO TO 730                                       3170
      IF (B(JJ).EQ.BLANK) GO TO 740                                     3175
      IF (B(JJ).EQ.MINUS) GO TO 750                                     3180
      IF (B(JJ).EQ.FLAG) GO TO 900                                      3185
C      THE NEXT GROUP OF STATEMENTS ALLOW FOR OCCASIONAL COUNTS GREATER 3190
C      THAN + OR - 1.                                                   3195
      IF (B(JJ).EQ.TWO) GO TO 760                                       3200
      IF (B(JJ).EQ.THREE) GO TO 770                                     3205
      IF (B(JJ).EQ.FOUR) GO TO 780                                      3210
      IF (B(JJ).EQ.FIVE) GO TO 790                                      3215
      IF (B(JJ).EQ.SIX) GO TO 800                                       3220
      IF (B(JJ).EQ.SEVEN) GO TO 810                                     3225
      IF (B(JJ).EQ.EIGHT) GO TO 820                                     3230
      IF (B(JJ).EQ.NINE) GO TO 830                                      3235
      IF (B(JJ).EQ.TEN) GO TO 840                                       3240
      IF (B(JJ).EQ.ELEVEN) GO TO 850                                    3245
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      IF (B(JJ).EQ.MTWO) GO TO 860                                      3250
      IF (B(JJ).EQ.MTHREE) GO TO 870                                    3255
      IF (B(JJ).EQ.MFOUR) GO TO 880                                     3260
      IF (B(JJ).EQ.MFIVE) GO TO 890                                     3265
      IF (B(JJ).EQ.DLTREC) GO TO 970                                    3270
      IF (B(JJ).EQ.KEY) GO TO 440                                       3275
  720 FORMAT (//5X,'SYMBOL NOT RECOGNIZED = ',Z8//)                     3280
      WRITE (6,720) B(JJ)                                               3285
C      IF SYMBOL IS NOT RECOGNIZED, STATION DATA IS NOT PRINTED IF IP=1. 3290
C      PROGRAM BRANCHES AND RE-INITIALIZES ALL VARIABLES FOR PROCESSING  3295
C      NEXT STATION IF IP=1. OTHERWISE, IT RETURNS TO READ NEXT RECORD.  3300
      IF (IP.EQ.1) GO TO 1510                                           3305
      GO TO 1570                                                        3310
  730 RX = 1.                                                           3315
      GO TO 910                                                         3320
  740 RX = 0.                                                           3325
      GO TO 910                                                         3330
  750 RX = -1.                                                          3335
      GO TO 910                                                         3340
  760 RX = 2.                                                           3345
      GO TO 910                                                         3350
  770 RX = 3.                                                           3355
      GO TO 910                                                         3360
  780 RX = 4.                                                           3365
      GO TO 910                                                         3370
  790 RX = 5.                                                           3375
      GO TO 910                                                         3380
  800 RX = 6.                                                           3385
      GO TO 910                                                         3390
  810 RX = 7.                                                           3395
      GO TO 910                                                         3400
  820 RX = 8.                                                           3405
      GO TO 910                                                         3410
  830 RX = 9.                                                           3415
      GO TO 910                                                         3420
  840 RX = 10.                                                          3425
      GO TO 910                                                         3430
  850 RX = 11.                                                          3435
      GO TO 910                                                         3440
  860 RX = -2.                                                          3445
      GO TO 910                                                         3450
  870 RX = -3.                                                          3455
      GO TO 910                                                         3460
  880 RX = -4.                                                          3465
      GO TO 910                                                         3470
  890 RX = -5.                                                          3475
      GO TO 910                                                         3480
  900 JJJ = NE                                                          3485
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      JJ = JJ+1                                                          3490
      FG = 1                                                             3495
      GO TO 710                                                          3500
C                                                                        3505
C      PROGRAM ADDS AND STORES CUMULATIVE SUMS. ONE UNIT EQUALS 0.01     3510
C      INCH.                                                             3515
  910 N = N+1                                                            3520
      NE = N/2                                                           3525
      NF = NE*2                                                          3530
      IF (NF.EQ.N) GO TO 920                                             3535
C      THIS FIDDLING AROUND DETERMINES IF THE COUNT IS EVEN OR ODD.      3540
C      START COUNTING IN THE ORDER YXYX.  X AND Y HAVE NORMAL            3545
C      ORIENTATIONS ON THE STRIP CHART. HOWEVER, X AND Y ARE INVERTED    3550
C      WITH RESPECT TO THE CALMA DIGITIZER. SPECIFICALLY, DEPTH          3555
C      INCREASES ALONG THE POSITIVE X-AXIS AND TEMP AND SALINITY ARE     3560
C      INCREASING FUNCTIONS ALONG THE Y-AXIS ON THE CALMA DIGITIZER.     3565
C      WARNING: DIGITIZE TRACES ACCORDING TO ABOVE ORIENTATION OR BE     3570
C      PREPARED TO RE-DIGITIZE TAPE LATER AFTER DISCOVERING GOOF.        3575
C                                                                        3580
C      IF ODD                                                            3585
      SUMD = SUMD+RX                                                     3590
C      ODD INDEX IS INCREASED TO KEEP IT SAME AS EVEN.                   3595
      NE = NE+1                                                          3600
      Y(NE) = SUMD                                                       3605
      JJ = JJ+1                                                          3610
      GO TO 930                                                          3615
C      IF EVEN                                                           3620
  920 SUMT = SUMT+RX                                                     3625
      X(NE) = SUMT                                                       3630
      JJ = JJ+1                                                          3635
C      IF STAR OR DOLLAR FOUND, END OF DATA HAS BEEN REACHED.            3640
  930 IF (B(JJ).EQ.DLR) GO TO 990                                        3645
C      ********************************************************          3650
C      ********** END OF NORMAL TRACE PROCESSING **********             3655
C                                                                        3660
C                                                                        3665
C      ********************************************************          3670
C      ********** BEGIN TROUBLE-SHOOTING **********                     3675
C      IF THERE IS NO IRG AT END OF HEADER BUT THERE IS A TRACER SYMBOL, 3680
C      THE PROGRAM SEPARATES THE TWO RECORDS BY FIRST SETTING NOIRG=1    3685
C      AND PROCESSING FIRST PART OF B-ARRAY AND THEN READING A NEW SET   3690
C      OF CARDS TO PROCESS SECOND PART OF B-ARRAY.                       3695
      IF (B(JJ).NE.STAR) GO TO 950                                       3700
      NOIRG = 1                                                          3705
C      SAVE THE INDEX OF THE START OF THE SECOND HALF, JJJJ.             3710
      JJJJ = JJ                                                          3715
      WRITE (6,940)                                                      3720
  940 FORMAT (/5X,'FOUND A STAR AT END OF TRACER ASSUME THERE IS NO IRG.  3725
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     1'/5X,'PROCESS RECORD IN TWO PARTS, READING CARDS FOR BOTH PARTS.'/     3730
     2)                                                                      3735
      GO TO 990                                                              3740
  950 IF (B(JJ).NE.KEY) GO TO 710                                            3745
      JJJJ = JJ                                                              3750
      WRITE (6,960)                                                          3755
  960 FORMAT (/5X,'FOUND A KEYBOARD SYMBOL.  PROCESS NEXT PORTION OF B-A     3760
     1RRAY AFTER READING NEW CARDS.'/)                                       3765
      NOIRG = 1                                                              3770
      GO TO 990                                                              3775
C                                                                            3780
  970 WRITE (6,980) JJ                                                       3785
  980 FORMAT (5X,'FOUND DELETE RECORD SYMBOL AT JJ= ',I5)                    3790
C      IF DELETE RECORD FOUND, PROGRAM INCREMENTS RECORD COUNT,IT,           3795
C      AND RESTARTS PROCESSING BUT DOES NOT READ A NEW PAIR OF CARDS.        3800
      GO TO 540                                                              3805
  990 JJ = JJ-1                                                              3810
C                                                                            3815
C      ***********************************************************           3820
C      ********** END TRACER AND ASSOCIATED TROUBLE-SHOOTING **********     3825
C                                                                            3830
C      UP TO THIS POINT, PROCESSING IS IDENTICAL FOR S AND T.                3835
C      START CONVERTING T AND D TO SCIENTIFIC UNITS                          3840
      WRITE (6,1000) JJJ,NE,Y(NE),X(NE)                                      3845
 1000 FORMAT (/5X,'LABEL 1000. START CONDENSING UNCONVERTED ARRAY AND CO     3850
     1NVERTING TO SCIENTIFIC UNITS.'/5X,'THE TRACER ENTERED THE FRAME (F     3855
     2LAG) AT JJJ= ',I5/5X,'THE END OF THE TRACE HAS INDEX NE= ',I5/         3860
     3 5X,'LAST (UNCONVERTED) DEPTH AND TEMP ARE: ',F7.1,2X,F7.1/)           3865
C                                                                            3870
C                                                                            3875
C      CHECK TO SEE IF FLAG WAS FOUND.                                       3880
      IF (FG.EQ.1) GO TO 1020                                                3885
      WRITE (6,1010)                                                         3890
 1010 FORMAT (/5X,'NO FLAG FOUND; PROCESS ANYWAY.'/)                         3895
 1020 WRITE (6,1030)                                                         3900
 1030 FORMAT (' ')                                                           3905
      FG = 0                                                                 3910
C                                                                            3915
C      THE X AND Y ARRAYS ARE FILLED AND THE START AND END OF THIS BATCH     3920
C      OF DATA ARE LABELLED WITH JJJ AND NE.                                 3925
C      CONVERT THE ARRAYS INDEXED ON 0.01-INCH DEPTH SPACINGS.               3930
C      SUBROUTINE CONDNS SERVES THIS PURPOSE ALTHOUGH IT NO LONGER           3935
C      CONDENSES  A SECOND ARRAY TO SMALLER SIZE, NOR DOES IT PAD THE        3940
C      GAP BETWEEN ARRAYS, BUT WITHIN ONE SEGMENT, IT DOES INTERPOLATE       3945
C      TO FILL ANY BLANK ARRAY POSITIONS.                                    3946
C                                                                            3950
C                                                                            3955
C      TO THOSE FAMILIAR WITH EARLIER VERSIONS OF THIS PROGRAM, THE          3960
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C       FOLLOWING CONDENSE ROUTINES WILL NOT EVEN APPEAR REMOTELY              3965
C       SIMILAR. THE EARLIER VERSION HAD TO BE EXTENSIVELY MODIFIED            3970
C       TO PERMIT MULTIPLE DEPTH SCALES. SPECIFICALLY, WHEN USING              3975
C       MULTIPLE DEPTH SCALES ONE'S DEPTH AXIS REFERENCE CHANGES AND           3980
C       CONSEQUENTLY IN CONSTRUCTING THE S AND D OR T AND D ARRAYS             3985
C       THIS ROUTINE WORKS WELL.                                               3990
        IF (ICODE.EQ.0) GO TO 1080                                             3995
C   *                                                                   *      4000
C   S*******************************************************************S      4005
C       CONDENSE THE X AND Y ARRAYS INTO S AND D                               4010
C   S*******************************************************************S      4015
C   *                                                                   *      4020
        KS = KS+2                                                              4025
        KS1 = KS-1                                                             4030
        KS2 = KS+1                                                             4035
        IF (IDSCL.EQ.1) GO TO 1040                                             4040
        KDT1 = KSCARF+1                                                        4045
        GO TO 1050                                                             4050
 1040   KDT1 = INSA(KS1)                                                       4055
 1050   CALL CONDNS (X,Y,S1,JJJ,NE,KDT1,KDTH1,KDTH2)                           4060
        KDTA = KDTH1+1                                                         4065
        K = KDTH1                                                              4070
        IF (IDSCL.EQ.1) GO TO 1060                                             4075
        K = KDT1                                                               4080
C                                                                              4085
C                                                                              4090
 1060   DO 1070 J=KDTH1,KDTH2                                                  4095
        D(K) = (J-1)/DCON(IDSCL)+CORD                                          4100
        S(K) = S1(J)/SCON+CORRS(ISCL)+SCOR                                     4105
        K = K+1                                                                4110
        KSCARF = K                                                             4115
 1070   CONTINUE                                                               4120
C                                                                              4125
C                                                                              4130
        INSA(KS) = KDTH1                                                       4135
        INSA(KS2) = KDTH2                                                      4140
        GO TO 1130                                                             4145
C   *                                                                   *      4150
C   T*******************************************************************T      4155
C       CONDENSE THE X AND Y ARRAYS INTO T AND D                               4160
C   T*******************************************************************T      4165
C   *                                                                   *      4170
 1080   KT = KT+2                                                              4175
        KT1 = KT-1                                                             4180
        KT2 = KT+1                                                             4185
        IF (IDSCL.EQ.1) GO TO 1090                                             4190
        KDT1 = KBARF+1                                                         4195
        GO TO 1100                                                             4200
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 1090 KDT1 = INTA(KT1)                                                  4205
 1100 CALL CONDNS (X,Y,T1,JJJ,NE,KDT1,KDTH1,KDTH2)                      4210
      KDTA = KDTH1+1                                                    4215
      K = KDTH1                                                         4220
      IF (IDSCL.EQ.1) GO TO 1110                                        4225
      K = KDT1                                                          4230
C                                                                       4235
C                                                                       4240
 1110 DO 1120 J=KDTH1,KDTH2                                             4245
      D(K) = (J-1)/DCON(IDSCL)+CORD                                     4250
      T(K) = T1(J)/TCON+CORRT(ITSCL)+TCOR                               4255
      K = K+1                                                           4260
      KBARF = K                                                         4265
 1120 CONTINUE                                                          4270
C                                                                       4275
C                                                                       4280
      INTA(KT) = KDTH1                                                  4285
      INTA(KT2) = KDTH2                                                 4290
C   *                                                                   *4295
C   T*******************************************************************T4300
 1130 CONTINUE                                                          4305
C
C      ***************************************************************
C      ********************** HAND-ENTERED DATA **********************
C
C      CONVERSION OF X AND Y ARRAYS INTO T AND S ARRAYS IS COMPLETE.    4310
C      AT THIS POINT, SURFACE AND NEAR-SURFACE DATA WILL BE INSERTED.   4315
C      NORMALLY, ONLY SURFACE VALUES NEED TO BE INSERTED DUE TO THE     4320
C      DIGITIZER OPERATOR BEGINNING TO TRACE SLIGHTLY BELOW HIS ZERO    4325
C      DEPTH REFERENCE POINT. SURFACE DATA VALUES ARE INSERTED BY       4330
C      CHECKING THE VALUE OF IH. IF IH=0, DATA IS NOT INSERTED. IF IH=1,4335
C      SURFACE DEPTH,TEMP, AND SALINITY VALUES ARE INSERTED VIA &DAT    4340
C      DATA CARD FOR PARTICULAR STATION.                                4345
C      CAUTION: HAND-ENTERED DATA VALUES SHOULD BE CORRECTED VALUES     4350
C      IF CORRECTIONS,TCOR AND SCOR, ARE APPLICABLE.                    4355
C      INFREQUENTLY, DATA VALUES BELOW THE SURFACE MUST BE INSERTED.    4360
C      PROVISION IS MADE FOR NEAR-SURFACE DEPTHS DOWN TO APPROXIMATELY  4365
C      15 METERS. THIS OCCURS DUE TO THE SAME REASON AS ABOVE(IE. A NOT 4370
C      SO METICULOUS OPERATOR BEGAN DIGITIZING BELOW ZERO REFERENCE     4375
C      POINT.). SINCE THIS OCCURS SELDOM, AND INVOLVES A SIGNIFICANT    4380
C      AMOUNT OF LABOR TO MANUALLY READ THE STD TRACE, CORRECT THE      4385
C      VALUES IF NEEDED AND PLACE ON &DAT CARD, THIS OPERATION WILL     4390
C      ONLY BE DONE FOR FINAL OUTPUT TO TAPE,CARD OR PRINTER.           4395
C      CONSEQUENTLY, TO INSERT NEAR-SURFACE DATA ISQZ MUST EQUAL 1,     4400
C      IH MUST BE GREATER THAN OR EQUAL TO 2. DH,TH, AND SH WERE        4405
C      DIMENSIONED AT 50. THIS EQUATES TO APPROXIMATELY 15 METERS.      4410
C      ISQZ=1 WAS CHOSEN AS DETERMINING VALUE DUE ALL ELEMENTS OF D,T,  4415
C      AND S ARRAYS ARE PRINTED OUT VIA OUT1. THIS ELIMINATES           4420
```

```
C       'GUESSWORK' OF WHICH VALUES SHOULD BE INSERTED. IN OTHER WORDS,      4425
C        ALL OF THEM ARE INSERTED.                                           4430
        IF (IH.EQ.0) GO TO 1150                                              4435
        S(1) = SH(1)                                                         4440
        T(1) = TH(1)                                                         4445
        IF (IH.LT.2) GO TO 1150                                              4450
        IF (ISQZ.GT.1) GO TO 1150                                            4455
C                                                                            4460
C                                                                            4465
        DO 1140 J=2,IH                                                       4470
        S(J) = SH(J)                                                         4475
        T(J) = TH(J)                                                         4480
        D(J) = DH(J)                                                         4485
 1140 CONTINUE                                                               4490
C                                                                            4495
C                                                                            4500
 1150 CONTINUE                                                               4505
C  *                                                                         4510
C-------------------                                                         4515
        IPLACE=1155                                                          4520
        WRITE (6,210) (D(J),J=1,1801,20)                                     4525
        WRITE (6,210) (T(J),J=1,1801,20),IPLACE                              4530
        WRITE (6,210) (S(J),J=1,1801,20),IPLACE                              4535
        WRITE (6,220) (INSA(J),J=1,10)                                       4540
        WRITE (6,230) (INTA(J),J=1,10)                                       4545
        WRITE (6,240) KS,KS1,KS2,KT,KT1,KT2,JJJ,NE,KDTH1,KDTH2,KDTA,KDT1,J  4550
       1JJJ                                                                  4555
C-------------------                                                         4560
C                                                                            4565
        IF (IP.EQ.1) GO TO 1160                                              4570
        IF (NOIRG.EQ.1) GO TO 400                                            4575
        GO TO 1570                                                           4580
 1160 IN1 = KBARF                                                            4585
        IN2 = KSCARF                                                         4590
        KDTA = MINO(IN1,IN2)                                                 4595
 1170 FORMAT (5X,'LABEL=1170.',3I7//)                                        4600
        WRITE (6,1170) IN1,IN2,KDTA                                          4605
C       ************************************************************         4610
C       ********** EDITING OF UNWANTED ZERO DATA VALUES **********          4615
C                                                                            4620
C       IN DIGITIZING TEMP AND SALINITY SEGMENTS OF TRACES ONE CAN NOT       4625
C       AVOID GETTING GAPS SOMETIMES BETWEEN TRACE SEGMENTS. WHEN THIS       4626
C       HAPPENS THE OUTPUT PRINTOUT WILL SHOW -5.0 AND 0.0 FOR THE           4630
C       TEMPERATURE AND SALINITY VALUES RESPECTIVELY. THESE VALUES ARE       4635
C       THE PRE-INITIALIZED VALUES OF THE T AND S ARRAYS, AND INDICATE       4640
C       NO ATTEMPT HAS BEEN MADE TO PLACE DATA IN THE PARTICULAR ARRAY       4645
C       POSITION (IE A GAP IN DATA). IT IS DESIRABLE THAT THESE UNWANTED     4650
C       VALUES OR GAPS BE ELIMINATED PRIOR TO WRITING A TAPE OR PUNCHING     4655
```

```
C       A CARD. THUS A CHECK IS MADE TO SEE IF T(J) OR S(J) ARE -5.0 OR      4656
C       0.0 RESPECTIVELY. IF T(J) AND S(J) ARE NOT -5.0 OR 0.0               4657
C       RESPECTIVELY, THE VALUES ALONG WITH DEPTH ARE PLACED INTO D2,T2,     4658
C       AND S2 ARRAYS. IF GAPS DO EXIST, THE VALUES ARE WRITTEN OUT AND      4659
C       COUNTED BUT NOT PUT INTO THE D2,T2,AND S2 ARRAYS.  THIS PROCESS      4660
C       IN EFFECT DISCARDS THE GAPS IN THE DATA. THE D,T, AND S ARRAYS       4665
C       ARE THEN RE-INITIALIZED, AND THE D2,T2,AND S2 ARRAYS ARE PUT BACK    4670
C       INTO THE D,T,AND S ARRAYS. NOTE, THE VALUE OF KDTA WHICH             4675
C       IS EQUAL TO TOTAL NUMBER OF RECORDS IS REDUCED BY NUMBER OF          4680
C       UNWANTED RECORDS BY MAKING USE OF THE VARIABLE KDTAF.                4685
      K = 0                                                                  4690
      L = 1                                                                  4695
C                                                                            4700
C                                                                            4705
      DO 1200 J=1,KDTA                                                       4710
      IF ((T(J).EQ.-5.0).OR.(S(J).EQ.0.0)) GO TO 1180                        4715
      D2(L) = D(J)                                                           4720
      T2(L) = T(J)                                                           4725
      S2(L) = S(J)                                                           4730
      L = L+1                                                                4735
      GO TO 1200                                                             4740
 1180 WRITE (6,1190) D(J),T(J),S(J),J                                        4745
      K = K+1                                                                4750
      JSAV = K                                                               4755
 1190 FORMAT (//5X,3F7.2,I6,//)                                              4760
 1200 CONTINUE                                                               4765
C                                                                            4770
C                                                                            4775
 1210 FORMAT (//5X,' JSAV=',I6,//)                                           4780
      WRITE (6,1210) JSAV                                                    4785
      KDTAF = KDTA-JSAV                                                      4790
      KDTA = KDTAF                                                           4795
C                                                                            4800
C                                                                            4805
      DO 1220 J=1,1801                                                       4810
      D(J) = 0.0                                                             4815
      T(J) =-5.0                                                             4820
      S(J) = 0.0                                                             4825
 1220 CONTINUE                                                               4830
C                                                                            4835
C                                                                            4840
C                                                                            4845
C                                                                            4850
      DO 1230 J=1,KDTA                                                       4855
      D(J) = D2(J)                                                           4860
      T(J) = T2(J)                                                           4865
      S(J) = S2(J)                                                           4870
 1230 CONTINUE                                                               4875
```

```
C                                                                       4880
C                                                                       4885
C      ***************************************************************  4890
C      ******************** SOUND VELOCITY AND SIGMA-T ******************  4895
C                                                                       4900
C      PRODUCE SOUND VELOCITY AND SIGMA-T WHEN IP.EQ.1                  4905
       CALL SVEL (D,T,S,SV,KDTA)                                        4910
       CALL SIGMT (S,T,SIG,KDTA)                                        4915
C                                                                       4920
C      ***************************************************************  4925
C      ************ CONSECUTIVE RECORD SERIALIZATION ROUTINE ***********  4930
C                                                                       4935
C      ARRAYS ARE COMPLETE AT THIS POINT FROM INDEX 1 TO THE END OF     4940
C      THE SMALLER OF THE SALINITY OR TEMPERATURE ARRAYS.               4945
C      GENERATE SERIAL NUMBERS FOR THE RECORDS.                         4950
       IF (JREC.GT.18) GO TO 1240                                       4955
       JREC = 1                                                         4960
 1240  CONTINUE                                                         4965
C                                                                       4970
C                                                                       4975
       DO 1250 J=1,KDTA                                                 4980
       JREC = JREC+1                                                    4985
       IREC(J) = JREC                                                   4990
 1250  CONTINUE                                                         4995
C                                                                       5000
C                                                                       5005
C      ***************************************************************  5010
C      ************************  O U T P U T  ************************  5015
C                                                                       5020
C                                                                       5025
C      THIS SECTION CONVERTS THE LETTER DESIGNATOR FOR MONTH(AMONC) FROM 5030
C      THE SINGLE LETTER CODE ON THE DIGITIZED TAPE TO THE APPROPRIATE  5035
C      MONTH AND YEAR IN PREPARATION FOR WRITING THE OUTPUT.            5040
C                                                                       5070
C                                                                       5075
       DO 1260 J=1,13                                                   5080
       IF (AMONC.EQ.AMONCA(J)) GO TO 1280                               5085
 1260  CONTINUE                                                         5090
C                                                                       5095
C                                                                       5100
 1270  FORMAT (15X,'AMONC NEVER DID EQUAL AMONC(J).  CONSEQUENTLY,      5105
     1WMONTH WILL NOT BE DEFINED.'/)                                    5110
       WRITE (6,1270)                                                   5115
       GO TO 1290                                                       5120
 1280  WMONTH = EVENT(J)                                                5125
 1290  CONTINUE                                                         5130
C                                                                       5135
C      ***************************************************************  5140
```

```
C       ************** OCEANOGRAPHIC DATA STATION SUMMARIES *************
C
      IF (.NOT.PRT1) GO TO 1300
C
C       PRINT DATA
      WRITE (6,1560)
C       THE PARAMETER ISQZ PERMITS CONDENSING THE PRINTED DATA BY THE
C       FACTOR ISQZ
      CALL OUT1 (D,T,S,SV,SIG,KDTA,ISTA,WMONTH,IREC,JREC,ISQZ)
C
C       ************************************************************
C       ************************** WRITE TAPE **************************
C
 1300 IF (.NOT.TAPE) GO TO 1340
C       TAPE MUST BE TRUE ONLY ONCE, AT THE BEGINNING OF TAPE  WRITING.
C       WRITE HEADER STATION LABEL HERE.
      WRITE (8,1310) ISTA,WMONTH,KDTA
 1310 FORMAT (I5,A12,I6,17X)
      WRITE (8,1320) (D(J),T(J),S(J),SV(J),SIG(J),J=1,KDTA)
 1320 FORMAT (F6.2,2F6.3,F7.2,F7.4,8X)
C       LRECL WILL BE 40 DIGITS IN LENGTH. PROVIDE APPROPRIATE JCL.
      WRITE (6,1330) ISTA,WMONTH,JREC
 1330 FORMAT (5X,'DATA FOR STATION ',I5,A12,' WRITTEN ON TAPE UP TO
     1 RECORD ',I6)
C
C       ************************************************************
C       ******************** DATA CARD PUNCH ROUTINE ******************
C
 1340 IF (.NOT.CARDS) GO TO 1430
C
C       PUNCHED DATA IS COMPRESSED BY FACTOR ICSQZ. FORMAT FOR TWO
C       DATA SETS ON A CARD.  KCRD BECOMES THE NUMBER OF DATA PRINTED IF
C       IT IS EVENLY DIVISIBLE. OTHERWISE, LAST DATUM POINT IS PUNCHED.
C       SUPPLY JCL FOR CARD PUNCHING
      KCRD = KDTA/ICSQZ
      NCRDS = KCRD/2
      IDIF = KCRD-2*NCRDS
      IF (IDIF.EQ.0) GO TO 1360
      KCRD = KCRD+1
 1350 FORMAT (24X,'OCEANOGRAPHIC DATA FROM U C M II',//)
 1360 WRITE (7,1350)
      WRITE (7,1370) KCRD,ISTA,WMONTH,ICSQZ
 1370 FORMAT (1X,I4,' VALUES OF D,T,S,SV,SIGMT FOR STATION ',I4,A12,
     1 '  COMPRESSED BY  ',I3,/)
 1380 FORMAT (2X,'DEPTH',3X,'TEMP.',1X,'SALNTY.',1X,'SND.VEL.',1X,
     1 'SIGMA-T',3X,'DEPTH',2X,'TEMP.',1X,'SALNTY.',1X,'SND.VEL.',1X,
     2 'SIGMA-T')
 1390 FORMAT (2X,'METERS',2X,'DEG.C.',1X,'PPT.',4X,'M/SEC',13X,'METERS',
```

```
     1 1X,'DEG.C.',1X,'PPT.',4X,'M/SEC',10X,/)                                  5385
       WRITE (7,1380)                                                           5390
       WRITE (7,1390)                                                           5395
       ICS2 = ICSQZ*2                                                           5400
       J = 1                                                                    5405
       K1 = 1                                                                   5410
       KK = ICSQZ                                                               5415
 1400  FORMAT (1X,3F7.2,F9.2,F8.3,3X,3F7.2,F9.2,F8.3)                           5420
       WRITE (7,1400) D(K1),T(K1),S(K1),SV(K1),SIG(K1),D(KK),T(KK),S(KK),       5425
      1SV(KK),SIG(KK)                                                           5430
       J = 3                                                                    5435
 1410  IF (J.GT.NCRDS) GO TO 1420                                               5440
       K1 = (J-1)*ICS2                                                          5445
       KK = K1+ICSQZ                                                            5450
       WRITE (7,1400) D(K1),T(K1),S(K1),SV(K1),SIG(K1),D(KK),T(KK),S(KK),       5455
      1SV(KK),SIG(KK)                                                           5460
       J = J+1                                                                  5465
       GO TO 1410                                                               5470
 1420  IF (IDIF.EQ.0) GO TO 1430                                                5475
       K1 = KDTA                                                                5480
       WRITE (7,1400) D(K1),T(K1),S(K1),SV(K1),SIG(K1)                          5485
C                                                                               5490
CCCC    ************************************************************           5495
CCCC    ***************** HYDROGRAPHIC PROGRAM CARD PUNCH ***************           5500
C                                                                               5505
 1430  IF (.NOT.GCARDS) GO TO 1500                                              5510
       GCRD = KDTA/IGSQZ                                                        5515
       WRITE (7,1350)                                                           5520
 1440  FORMAT (1X,I4,' VALUES OF D , T , AND S  FOR STATION ',I4,A12,           5525
      1 '  COMPRESSED BY  ',I3,/)                                              5530
       WRITE (7,1440) GCRD,ISTA,WMONTH,IGSQZ                                    5535
 1450  FORMAT (2X,'DEPTH',7X,'TEMP.',4X,'SALINITY',15X,'STATION',4X,'DATE       5540
      1',5X,'VALUE',9X)                                                         5545
 1460  FORMAT (2X,'METERS',6X,'DEG.C.',5X,'PPT.',51X,/)                         5550
       WRITE (7,1450)                                                           5555
       WRITE (7,1460)                                                           5560
       J = 1                                                                    5565
       K1 = 1                                                                   5570
 1470  FORMAT (1X,F7.1,2X,F9.2,1X,F10.3,18X,I3,A12,'  K1=',I4,I8)               5575
       WRITE (7,1470) D(K1),T(K1),S(K1),ISTA,WMONTH,K1,J                        5580
       J = 2                                                                    5585
 1480  K1 = (J-1)*IGSQZ                                                         5590
       IF (K1.GE.KDTA) GO TO 1490                                               5595
       WRITE (7,1470) D(K1),T(K1),S(K1),ISTA,WMONTH,K1,J                        5600
       J = J+1                                                                  5605
       IF (J.GE.500) GO TO 1500                                                 5610
       GO TO 1480                                                               5615
 1490  K1 = KDTA                                                                5620
```

```
      WRITE (7,1470) D(K1),T(K1),S(K1),ISTA,WMONTH,K1,J                  5625
C                                                                        5630
CCC                                                                      5635
CCC    ***************************************************************   5640
CCC    JREC IS INCREMENTED HERE BY 1 TO ACCOUNT FOR TAPE ID LABEL FOR    5645
CCC    NEXT STATION TO BE PROCESSED.  THIS KEEPS SERIALIZATION OF        5650
C      RECORDS ON TAPE CONSECUTIVE AND INCLUDES LABELS FOR EACH STATION. 5655
 1500 JREC = JREC+1                                                      5660
CCC    ***************************************************************   5665
CCC                                                                      5670
C                                                                        5675
 1510 IF (ENDFL) END FILE 8                                              5680
C                                                                        5685
CCC    NORMALLY, ENDFL MUST BE TRUE ONCE ON THE LAST TAPE WRITING        5690
CCC    OPERATION. HOWEVER, IT IS NOT REQUIRED BY IBM.  IT IS WRITTEN     5695
CCC    ALWAYS AFTER LAST TAPE WRITING OPERATION WITHOUT COMMAND.         5700
CCC                                                                     5705
CCC    ***************************************************************   5710
CCC    ******** INITIALIZE VARIABLES AND ARRAYS FOR NEXT STATION *******   5715
CCC                                                                      5720
C                                                                        5725
      DO 1520 J=1,1801                                                   5730
      D(J) = 0.0                                                         5735
      T(J) =-5.0                                                         5740
      S(J) = 0.0                                                         5745
      D2(J) = 0.0                                                        5750
      T2(J) =-5.0                                                        5755
      S2(J) = 0.0                                                        5760
      T1(J) =-5.0                                                        5765
      S1(J) = 0.0                                                        5770
      IREC(J) = 0                                                        5775
 1520 CONTINUE                                                           5780
C                                                                        5785
CC                                                                       5790
      INSA(1) = 1                                                        5795
      INSA(2) = 1                                                        5800
      INTA(1) = 1                                                        5805
      INTA(2) = 1                                                        5810
      KBARF = 0                                                          5815
      KSCARF = 0                                                         5820
C                                                                        5825
CC                                                                       5830
      DO 1530 J=3,10                                                     5835
      INSA(J) = 980                                                      5840
      INTA(J) = 980                                                      5845
 1530 CONTINUE                                                           5850
C                                                                        5855
C                                                                        5860
```

```
      KS = 1                                                                5865
      KT = 1                                                                5870
C                                                                           5875
C                                                                           5880
      DO 1540 J=1,50                                                        5885
      SH(J) = 0.0                                                           5890
      TH(J) =-5.0                                                           5895
      DH(J) = 0.0                                                           5900
 1540 CONTINUE                                                              5905
C                                                                           5910
C                                                                           5915
      SKIP = .FALSE.                                                        5920
      JSAV = 0                                                              5925
      KDTAF = 1                                                             5930
      IDEPTH = 0                                                            5935
      IH = 0                                                                5940
      IP = 0                                                                5945
      IF (NOIRG.EQ.1) GO TO 400                                             5950
      GO TO 1570                                                            5955
C                                                                           5960
C     ************************************************************          5965
C     ************************ R E T U R N ***********************          5970
C                                                                           5975
 1550 CONTINUE                                                              5980
 1560 FORMAT ('1')                                                          5985
 1570 IT = IT+1                                                             5990
      GO TO 150                                                             5995
 1580 STOP                                                                  6000
      END                                                                   6005
```

```
C      ----------------SUBROUTINE OUT1 MOD1,JUNE 1975--------------------
       SUBROUTINE OUT1 (D,T,S,SV,SIG,N,ISTA,WMONTH,IREC,JREC,ISQZ)
       REAL *8WMONTH
       DIMENSION D(1), T(1), S(1), SV(1), SIG(1), IREC(1)
C        PRODUCE HEADING
   20  WRITE (6,30) ISTA,WMONTH,ISQZ
   30  FORMAT (//T38,'OCEANOGRAPHIC DATA FROM U C M II'//T41,'STATION ',
      1 I3,A12/T41,'COMPRESSED BY FACTOR ',I3///)
C        FORMAT FOR PRINTING TWO BLOCKS OF DATA PER PAGE.
       WRITE (6,40)
   40  FORMAT (T6,'DEPTH',T14,'TEMP.',T20,'SALNTY.',T28,'SND.VEL.',T36,'
      1 SIGMA-T',T48,'DEPTH',T56,'TEMP.',T62,'SALNTY.',T70,'SND.VEL.',
      2 T80,'SIGMA-T')
       WRITE (6,50)
   50  FORMAT (T6,'METERS',T14,'DEG.C.',T21,'PPT.',T29,'M/SEC',T48,
      1 'METERS',T56,'DEG.C.',T63,'PPT.',T71,'M/SEC'/)
       NN = N/2
       NO = N-2*NN
C
C
       DO 60 J=1,NN,ISQZ
       K = NN+J
       WRITE (6,70) D(J),T(J),S(J),SV(J),SIG(J),D(K),T(K),S(K),SV(K),SIG(
      1K),IREC(J),IREC(K)
   60  CONTINUE
C
C
   70  FORMAT (T6,F5.1,T14,F5.2,T21,F5.2,T28,F7.2,T39,F6.3,T48,F5.1,T56,F
      15.2,T63,F5.2,T70,F7.2,T81,F6.3,T90,2I8)
       IF (NO.EQ.0) GO TO 90
       WRITE (6,80) D(N),T(N),S(N),SV(N),SIG(N),IREC(N)
   80  FORMAT (T48,F5.1,T56,F5.2,T63,F5.2,T70,F7.2,T81,F6.3,T90,8X,I8)
   90  WRITE (6,100)
  100  FORMAT ('1')
       RETURN
       END
```

```
C       ---------------------- SUBROUTINE CHMOVE ----------------------
      SUBROUTINE CHMOVE (A,I,B,J)
C       THIS SUBROUTINE RETURNS A LOGICAL*1 VARIABLE TO A 4-BYTE ADDRESS
CC      IN THE MAIN PROGRAM, UNPACKING THE ORIGINAL 4-BYTE WORDS A
C       BYTE AT A TIME.
      LOGICAL *1A(1),B(1)
      B(J) = A(I)
      RETURN
      END
```

```
C       ---------------SUBROUTINE SVEL MOD.1,JUNE 73---------------                5
      SUBROUTINE SVEL (AA,BB,CC,SV,K1)                                            10
C       THIS COMPUTES SOUND VELOCITY FROM DEPTH, TEMPERATURE AND SALINITY        15
C       ACCORDING TO WILSON'S EQUATION                                           20
      DIMENSION AA(1), BB(1), CC(1), SV(1)                                        25
C                                                                                 30
C                                                                                 35
      DO 30 J=1,K1                                                                40
      Z = AA(J)                                                                   45
      T = BB(J)                                                                   50
      S = CC(J)                                                                   55
      IF (T.LT.-1.99.OR.S.LT.0.1) GO TO 20                                        60
      P = .1027*Z+1.282E-7*Z*Z                                                    65
      T2 = T*T                                                                    70
      T3 = T2*T                                                                   75
      VT = 4.5721*T-4.4532E-2*T2-2.6045E-4*T3+7.9851E-6*T3*T                      80
      P2 = P*P                                                                    85
      P3 = P2*P                                                                   90
      P4 = P2*P2                                                                  95
      VP = .160272*P+1.0268E-5*P2+3.5216E-9*P3-3.3603E-12*P4                     100
      SR = S-35.                                                                 105
      VS = 1.39799*SR+1.69202E-3*SR*SR                                           110
      VSTP = SR*(-1.1244E-2*T+7.7711E-7*T2+7.7016E-5*P-1.2943E-7*P2+3.15         115
     180E-8*P*T+1.579E-9*P*T2)+P*(-1.8607E-4*T+7.4812E-6*T2+4.5283E-8*T3         120
     2)+P2*(-2.5294E-7*T+1.8563E-9*T2)+P3*(-1.9646E-10*T)                        125
      SV(J) = 1449.14+VT+VP+VSTP+VS                                              130
      GO TO 30                                                                   135
   20 SV(J) = 0.                                                                 140
   30 CONTINUE                                                                   145
C                                                                                150
C                                                                                155
      RETURN                                                                     160
      END                                                                        165
```

```
C       ------------------------- SUBROUTINE SIGMT ---------------------
      SUBROUTINE SIGMT (AA,BB,SIG,K1)
C       THIS SUBROUTINE COMPUTES SIGMA-T FROM SALINITY AND
C       TEMPERATURE ACCORDING TO H.O.614 P.91
      DIMENSION AA(1), BB(1), SIG(1)
C
C
      DO 30 J=1,K1
      S = AA(J)
      T = BB(J)
      IF (T.LT.-1.99.OR.S.LT.0.1) GO TO 20
      CL = (S-0.03)/1.805
      B = T*(18.03-0.8164*T+0.01667*T**2)*10.**(-6)
      A = T*(4.7867-0.098185*T+0.0010843*T**2)*10.**(-3)
      SG = -0.069+1.4708*CL-0.001570*CL**2+0.0000398*CL**3
      SGA = -((T-3.98)**2/503.57)*((T+283)/(T+67.26))
      SIG(J) = SGA+(SG+0.1324)*(1-A+B*(SG-0.1324))
      GO TO 30
   20 SIG(J) = 0.
   30 CONTINUE
C
C
      RETURN
      END
```

```
C      ---------------------- SUBROUTINE CONDNS ----------------------
       SUBROUTINE CONDNS (X,Y,T1,JJJ,NE,KDT1,KDTH1,KDTH2)
C
C       SUBROUTINE CONDNS MOD. 3,17 SEPT 74  BY R. G. PAQUETTE.
C
C       THIS SUBROUTINE FINDS THE ARRAY LOCATIONS FOR X, INDEXED
C       SEQUENTIALLY FOR EACH UNIT OF Y.  EACH UNIT OF Y IS 1.0 AND
C       CORRESPONDS TO .01 INCHES OF TRAVEL IN THE DEPTH DIRECTION.
C       MOD. 3 FILLS IN BLANK ARRAY POSITIONS DUE TO THE DIGITIZER STEPP-
C       ING AHEAD MORE THAN .01 INCHES AT A STEP AND WRITES A MESSAGE
C       ON THE PRINTER.
       DIMENSION X(1), Y(1), T1(1), KINS(10), KNO(10)
C
CC      IF FIRST INDEX IS ZERO OR NEGATIVE THERE IS A MISBEHAVIOR ELSE-
C       WHERE IN THE PROGRAM.  RESET JJJ TO 1.
       IF (JJJ.GE.1) GO TO 30
       JJJ = 1
       WRITE (6,20)
    20 FORMAT (/5X,'****** JJJ RESET TO ONE - SOMETHING WRONG ******'/)
C       KDTH1 BECOMES THE INDEX OF THE START OF THIS ARRAY SEGMENT.
    30 KDTH1 = Y(JJJ)+1.50
C       IF KDTH1 BECOMES ZERO OR LESS(THE ORIGIN OF MEASUREMENT IS
CC      POSITIVE WITH RESPECT TO THE START OF TRACE), USE THE START
C       OF THE CURVE AS THE ORIGIN OF INDEXING.
C       THIS CAUSES AN OVERLAP BETWEEN ARRAYS, BUT IT SHOULD BE SMALL.
       XINC = 0.
       IF (KDTH1.GT.0) GO TO 40
       XINC = FLOAT(1-KDTH1)
       KDTH1 = 1
C
    40 JJ1 = JJJ+1
       NE1 = NE-1
C       FORM SUBSCRIPTS FROM THE DEPTH INCREMENTS AND STORE X'S AT THOSE
CC      ARRAY LOCATIONS.
CC      SEARCH FOR BLANKS IN ARRAY BETWEEN INDEXES KDTH1 AND KDTH2.
C       KCT COUNTS THE NUMBER OF BLANKS
       KCT = 0
       KSAV = KDTH1
C       KINS(J) IS THE NUMBER OF THE ARRAY POSITION FILLED.
CC
C
       DO 50 J=1,10
       KNO(J) = 0
    50 KINS(J) = 0
C
CC
CCC
C
```

```
      DO 80 J=JJ1,NE1                                                    245
      KDTH = Y(J)+1.50+XINC                                              250
      T1(KDTH) = X(J)                                                    255
C      TEST TO SEE IF INDEX IS THE SAME OR ONE GREATER THAN THE LAST     260
C      ONE.  IF NOT, INTERPOLATE VALUES.                                 265
      NREP = KDTH-KSAV                                                   270
      IF (NREP.LE.1) GO TO 70                                            275
      KCT = KCT+1                                                        280
      IF (KCT.GT.10) KCT = 10                                            285
      KNO(KCT) = NREP                                                    290
      KINS(KCT) = KDTH                                                   295
      II = KSAV+1                                                        300
      III = KDTH-1                                                       305
      E = FLOAT(NREP)                                                    310
      G = T1(KDTH)                                                       315
      F = G-T1(KSAV)                                                     320
C                                                                        325
C                                                                        330
      DO 60 I=II,III                                                     335
   60 T1(I) = (FLOAT(I-KSAV)/E)*F+T1(KSAV)                               340
C                                                                        345
C                                                                        350
   70 KSAV = KDTH                                                        355
   80 CONTINUE                                                           360
C                                                                        365
C                                                                        370
      KDTH2 = Y(NE)+1.50+XINC                                            375
C      INSERT THE FIRST POINT, WHICH OTHERWISE WOULD BE THE LAST         380
C      ONE FOR WHICH Y(J).LT.1.                                          385
      T1(KDTH1) = X(JJJ)                                                 390
      T1(KDTH2) = X(NE)                                                  395
C      SAVE INDEX OF END OF ARRAY.                                       400
C                                                                        405
C                                                                        410
C      WRITE DOWN NUMBER AND LOCATIONS OF INTERPOLATED VALUES.           415
      WRITE (6,90) KCT,(KINS(I),I=1,KCT),(KNO(I),I=1,KCT)               420
   90 FORMAT (/5X,'BLANK ARRAY POSITIONS FILLED IN ',I3,' PLACES.  BEGIN 425
     1NING INDEXES AND NO. OF STEPS'/5X,'(10 EACH) ARE: ',5X,10I6/       430
     2 5X,10I6/)                                                         435
      RETURN                                                             440
      END                                                                445
```

APPENDIX E

```
C TITLE          DIGIXBT                                                    5
CC                                                                         10
CC                                                                         15
C PROGRAMERS     R.E.BLUMBERG, R.E. GREER. ADAPTED FROM DIGISTD PROGRAM     20
CC                WHICH WAS AN EXTENSIVE MODIFICATION OF AN ORIGINAL       25
CC                PROGRAM, MIZ2, BY R.G. PAQUETTE.                         30
CC                                                                         35
C DOCUMENTATION  R.E.BLUMBERG                                              40
CC                                                                         45
C DATE           26 JUNE 1975                                              50
CC                                                                         55
C PURPOSE        PROGRAM READS AND PROCESSES DIGITIZED TEMPERATURE,AND     60
CC                DEPTH DATA FROM A CALMA DIGITIZER 7-TRACK TAPE.THE       65
CC                DATA IS COMPUTED AND STORED FOR EVERY 0.01 OF AN INCH    70
CC                OF DEPTH INCREMENT ON THE XBT TRACE. PROGRAM COMPUTES    75
CC                DEPTH AND TEMPERATURE FOR EACH INDIVIDUAL                80
CC                OCEANOGRAPHIC STATION AND PERMITS PRINTED, PUNCHED       85
CC                CARD OR 9-TRACK TAPE OUTPUT. NOTE, THIS PROGRAM IS       90
CC                SET UP TO PROCESS WATER TEMPS BETWEEN 1 AND 25 DEGREES   95
CC                CELSIUS.                                                100
CC                                                                        105
C SEQUENCE       THE PROGRAM PERFORMS THESE FUNCTIONS IN THE FOLLOWING     110
CC                SEQUENCE:                                               115
CC                  (A) INITIALIZES ALL ARRAYS AND VARIABLES              120
CC                  (B) SKIPS XXX NUMBER OF RECORDS IF NSKP=GREATER THAN  125
CC                    ZERO.                                               130
CC                  (C) READ PAIR OF DATA CARDS (LABEL AND DAT) FOR       135
CC                    RECORD BEING PROCESSED. COUNT RECORDS.              140
CC                  (D) PROGRAM TERMINATES IF ISTOP=1 OR DESIRED NUMBER   145
CC                    OF RECORDS PROCESSED.                               150
CC                  (E) HEADER INFO MISSING ON TAPE, INSERT ON CARDS BY   155
CC                    SETTING IHDR=1.                                     160
CC                  (F) SKIP UNREADABLE OR BAD RECORD IF NRCSKP SET       165
CC                    EQUAL TO THE BAD RECORD NUMBER.                     170
CC                  (G) READ USABLE RECORD INTO THE A ARRAY               175
CC                  (H) MOVE BYTES OF A ARRAY INTO 4-BYTE WORDS OF B      180
CC                    ARRAY TO ALLOW PROCESSING BY STANDARD FORTRAN.      185
CC                  (I) PROCESS RAW B ARRAY                               190
CC                      (1) IF HEADER RECORD, PROGRAM DECODES HEADER      195
CC                        LABEL AND COMPARES TO LABEL SUPPLIED BY DATA     200
CC                        CARD.                                           205
CC                      (2) IF TRACER RECORD, PROGRAM ADDS AND STORES     210
CC                        CUMULATIVE SUMS OF X AND Y DISTANCE TRAVEL.     215
C                         SUBROUTINE CONDNS INDEXES THE VALUES OF         220
```

```
C                       CUMULATIVE DISTANCE BY INCREASING DEPTH UNITS.
C                     (J) CONVERT THE X AND Y ARRAYS TO DEPTH AND
C                       TEMPERATURE.
C                     (K) MANUALLY INSERT SURFACE AND NEAR SURFACE VALUES
C                       VIA DATA CARDS.
C                     (L) ELIMINATE EXCESSIVELY HIGH OR LOW VALUES.
C                     (M) COMPUTE CONSECUTIVE RECORD SERIALIZATION FOR
C                       TAPE OUTPUT NUMBERING SCHEME.
C                     (N) CONVERTS LETTER DESIGNATOR MONTH/YEAR CODE,
C                       AMONC, TO REAL*8 MONTH AND YEAR.
C                     (O) DATA OUTPUT IN EITHER REGULAR PRINTOUT, TAPE, OR
C                       PUNCHED CARDS. CARD OUTPUT SUITABLE FOR THESIS1.
C                     (P) INITIALIZE ARRAYS AND VARIABLES FOR PROCESSING
C                       NEXT STATION'S DATA.
C                     (Q) REPEAT STEPS (C) THRU (P) UNTIL ALL RECORDS ARE
C                       PROCESSED, ISTOP=1, OR THE NUMBER OF DESIRED
C                       RECORDS (NN) ARE READ.
C
C FEATURES          THIS IS A HIGHLY VERSATILE PROGRAM FOR PROCESSING
C                     OCEANOGRAPHIC DATA FROM 7-TRACK TAPE. FEATURES OF THE
C                     PROGRAM ARE LISTED UNDER THE FOLLOWING SIX GENERAL
C                     CATEGORIES:
C                       (A) INPUT
C                           (1) 7-TRACK CALMA DIGITIZER TAPE IN BCD.
C                           (2) TWO DATA CARDS REQUIRED PER TRACE SEGMENT
C                             RECORD OR HEADER LABEL RECORD. AN XBT TRACE
C                             REQUIRES 4 CARDS, ONE PAIR FOR THE HEADER AND
C                             ONE PAIR FOR THE TRACE. THE FOLLOWING IS A
C                             SAMPLE DATA DECK SHOWING DATA CARDS FOR STATION
C                             207 AND 208. ALSO SHOWN IS THE 'STATION END'
C                             CARD WITH ISTOP SET EQUAL TO ONE. THIS IS
C                             FOLLOWED BY THE JCL NECESSARY TO READ THE 7-
C                             TRACK TAPE.COLUMN 1 IS BLANK ON THE DATA CARDS.
C       &CONTRL NN=104,IDSCL=1,ICODE=0,ITSCL=1,ISCL=1,IP=1,ISQZ=01,
C       ICSQZ=3,TAPE=F,CARDS=F,TCOR=-.13,XBTCOR=0.0,NSKP=6,&END
C           UCMXBT STATIONS 201V THRU 317V TAPE UCM011
C           HEADER XBT
C       &DAT  IDEPTH=99,ISTA=207,AMONC='V',&END
C           TRACER XBT                                                  V
C       &DAT   IDEPTH=00,DH=0.0,TH=12.12,IH=1,&END
C           HEADER XBT
C       &DAT  IDEPTH=99,ISTA=208,AMONC='V',&END
C           TRACER XBT                                                  V
C       &DAT   IDEPTH=00,&END
C            STATION END                                               1
C      //GO.METTAP DD UNIT=2400-1,VOL=SER=UCM011,DISP=OLD,LABEL=(,NL),
C      //       DCB=(DEN=1,TRTCH=ET)
C                     (B) SUBROUTINES
```

```
C                (1) TPRD-READS THE 7-TRACK MAGNETIC TAPE.                    465
C                (2) CHMOVE- TAKES THE DATA THAT HAS BEEN READ                470
C                  INTO THE A ARRAY AND STORES IT IN USABLE FORM               475
C                  IN THE B ARRAY.                                            480
C                (3) CONDNS- INDEXES THE VALUES OF CUMULATIVE                 485
C                  DISTANCE BY INCREASING DEPTH UNITS.                        490
C                (4) OUT2- PRINTS OUT OCEANCGRAPHIC STATION DATA.             495
C             (C) AUTOMATIC DATA PROCESSING/HANDLING                          500
C                (1) HANDLES OPERATOR MISTAKES MADE IN TRACING XBT            505
C                  CURVES ON CALMA DIGITIZER.                                 510
C                (2) SKIPS INITIAL NUMBER AND INDIVIDUAL BAD                  515
C                  RECORDS ON 7-TRACK TAPE.                                   520
C                (3) DECODES 7-TRACK TAPE HEADER LABELS AND TRACE             525
C                  RECORDS.                                                   530
C                (4) COMPUTES DATA FOR EVERY 0.01 INCH OF CALMA               535
C                  DIGITIZER STYLUS MOVEMENT.                                 540
C                (5) ALLOWS ENTRY OF HAND ENTERED DATA FOR                    545
C                  SURFACE AND NEAR SURFACE VALUES.                           550
C                (6) EDITS OUT EXCESSIVELY LOW & HIGH VALUES.                 555
C                (7) PROVIDES CONSECUTIVE RECORD SERIALIZATION                560
C                  FOR TAPE OUTPUT.                                           565
C             (D) DIAGNOSTICS                                                 570
C                (1) WRITES FIRST TWENTY FIVE VALUES OF DEPTH AND             575
C                  TEMPERATURE FOR DATA INSPECTION.                           580
C             (E) TROUBLE-SHOOTING                                            585
C                (1) HANDLES MULTIPLE KEYBOARD AND TRACER SYMBOL              590
C                  ENTRIES.                                                   595
C                (2) PROVIDES FOR A MISSED OR INCOMPLETE HEADER               600
C                  LABEL.                                                     605
C                (3) HANDLES MISSING INTER-RECORD GAP (IRG).                  610
C                (4) HANDLES DELETE RECORD BY INCREMENTING RECORD             615
C                  COUNT AND READING SAME PAIR OF CARDS AGAIN.                620
C                (5) COMPARES CARD HEADER LABEL AND TAPE HEADER               625
C                  LABEL AND ACCEPTS CARD VALUES IF CARD AND TAPE             630
C                  DISAGREE.                                                  635
C             (F) OUTPUT                                                      640
C                (1) PRINTER- TWO PRINTING VARIABLES, PRT1 AND                645
C                  PRT2. PRT2 PROVISION ONLY.                                 650
C                (2) CARD-PUNCHED DATA CARDS SUITABLE FOR USE WITH            655
C                  THESIS1.                                                   660
C                (3) TAPE- 9-TRACK TAPE                                       665
C                (4) PLOTTING- PROVISION FOR PLOTTING ROUTINES                670
C                  ACTUATED BY PLT1 AND PLT2 ARE NOT PRESENTLY                675
C                  PROGRAMMED.                                                680
C                                                                             685
C ARGUMENTS      PROGRAM CONSISTS OF MANY TERMS,ARRAYS,AND VARIABLES.         690
C                  SOME OF THESE VARIABLES ARE USED IN THE DIGISTD            695
C                  PROGRAM. THEY WERE INCLUDED IN THIS PROGRAM TO KEEP        700
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C     THE HEADER LABEL PROCESSING ON THE CALMA DIGITIZER          705
C     THE SAME FOR BOTH STD AND XBT TRACES. THESE VARIABLES       710
C     ARE IDENTIFIED BELOW AND ARE SET EQUAL TO A CONSTANT        715
C     IN THIS PROGRAM.                                            720
C     THE FOLLOWING IS A BRIEF DESCRIPTION OF THE                 725
C     IMPORTANT ARGUMENTS LISTED ALPHABETICALLY UNDER TWO         730
C     GENERAL CATEGORIES:                                         735
C                                                                 740
C      (A) ARRAYS                                                 745
C          D,T       = DEPTH,TEMPERATURE                         750
C          DH,TH     = HAND-ENTERED SURFACE OR NEAR SURFACE      755
C                      DATA                                       760
C          X,Y       = CUMULATIVE SUMS OF DISTANCE TRAVELED BY   765
C                      THE DIGITIZER STYLUS. STORAGE IS           770
C                      PROVIDED FOR 20 INCHES TOTAL TRAVEL        775
C                      OF THE STYLUS ON EACH COORDINATE           780
C                      AXIS. THIS INCLUDES BOTH PLUS AND MINUS    785
C                      DIRECTIONS.                                790
C          NRCSKP    = NUMBER OF THE INDIVIDUAL RECORD SKIPPED   795
C          DCON      = DEPTH CONSTANT  NUMBER OF 0.01 INCHES     800
C                      PER UNIT OF DEPTH.                         805
C          IREC      = CONSECUTIVE SERIAL RECORD NUMBER FOR      810
C                      TAPE                                       815
C          AMONCA    = MONTH/YEAR CODE LETTER.                   820
C          EVENT     = MONTH AND YEAR.                           825
C                                                                 830
C      (B) VARIABLES                                              835
C          CARDS     = PERMITS PUNCHING CARDS                    840
C          CONTRL    = NAMELIST VARIABLE USED FOR INFREQUENTLY   845
C                      CHANGED VARIABLES.                         850
C          DCOR      = DEPTH CORRECTION TERM.                    855
C          DAT       = NAMELIST VARIABLE USED FOR                860
C                      FREQUENTLY CHANGED VARIABLES.              865
C          DLTREC    = DELETE RECORD                             870
C          FLAG      = INDICATES START OF DATA TRACE.            875
C          ICODE     = VARIABLE HELD OVER FROM DIGISTD           880
C                      ICODE IS A CONSTANT = ZERO.                885
C          ICSQZ     = VARIABLE USED TO COMPRESS NUMBER OF       890
C                      DATA POINTS PUNCHED ON CARDS.              895
C          IDENT     = VARIABLE USED TO IDENTIFY HEADER          900
C                      LABEL, (IDENT =99) OR TRACE RECORD         905
C                      (IDENT = 00).                              910
C          IDSCL     = VARIABLE HELDOVER FROM DIGISTD PROGRAM    915
C                      IDSCL IS A CONSTANT = 1.                   920
C          IH        = NUMBER OF HAND ENTERED SURFACE OR         925
C                      NEAR-SURFACE DATA VALUES.                  930
C          IHDR      = VARIABLE USED TO IDENTIFY MISSED HEADER   935
C                      LABEL ON TAPE. ALLOWS MISSING INFO TO BE   940
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C                    INSERTED ON CARDS.                                    945
C          IP      = VARIABLE IDENTIFIES LAST RECORD OF                    950
C                    PARTICULAR STATION. SINCE XBT IS A                    955
C                    SINGLE TRACE IP IS A CONSTANT = 1.                    960
C          ISCL    = VARIABLE HELD OVER FROM DIGISTD                       965
C                    PROGRAM ISCL IS A CONSTANT = 1.                       970
C          ISQZ    = VARIABLE USED TO COMPRESS NUMBER                      975
C                    OF DATA POINTS PRINTED BY PRINTER.                    980
C          ISTA    = VARIABLE IDENTIFIES STATION NUMBER.                   985
C          ISTOP   = VARIABLE TERMINATES PROGRAM IF = 1 ON                 990
C                    FINAL &DAT CARD.                                      995
C          ITSCL   = VARIABLE HELDOVER FROM DIGISTD PROGRAM               1000
C                    ITSCL IS A CONSTANT = 1.                             1005
C          JREC    = VARIABLE USED TO COUNT RECORDS FOR                   1010
C                    RECORD SERIALIZATION PURPOSES.                       1015
C          JSKIP   = VARIABLE USED TO CONTRL NUMBER OF                    1020
C                    DATA CARDS READ.                                     1025
C          KEY     = KEYBOARD SYMBOL ON THE DIGITIZED TAPE.               1030
C          KOTH2   = NUMBER OF RECORD PROCESSED FOR                       1035
C                    PARTICULAR STATION.                                  1040
C          LABEL   = HEADER TYPE DATA CARD WHICH                          1045
C                    IDENTIFIES STATION NUMBER, MONTH, ETC.               1050
C          NCRDS   = NUMBER OF CARDS PUNCHED BY CARDS                     1055
C                    PUNCHING ROUTINE.                                    1060
C          NE      = AN INDEX AT THE LAST USEFUL ARRAY                    1065
C                    POSITION OF THE X(DEPTH) ARRAY.                      1070
C          NOIRG   = VARIABLE USED TO INDICATE MISSING                    1075
C                    END OF RECORD GAP ON TAPE.                           1080
C          NPTS    = NUMBER OF DATA POINTS TO BE PUNCHED                  1085
C                    BY CARDS PUNCHING ROUTINE.                           1090
C          NSKP    = NUMBER OF INITIAL RECORDS ON TAPE                    1095
C                    TO BE SKIPPED                                        1100
C          TCOR    = CORRECTION FACTOR ADDED TO                           1105
C                    TEMPERATURE DATA VALUES.                             1110
C          WMONTH  = REAL*8 -MONTH AND YEAR                               1115
C ------------------------------ SUBROUTINE TPRD ------------------------
C TPRD IS IN ASSEMBLER LANGUAGE AND REQUIRES SPECIAL JCL.
C THE COMMENT CARDS ARE INCLUDED HERE BECAUSE NO COMMENT CARDS ARE
C ALLOWED TO BE MIXED WITH THE ASSEMBLER LANGUAGE SUBROUTINE.
C A  /*  FOLLOWED BY A  //ASM.SYSIN DD *  MUST PRECEDE THE DECK.
C THIS DECK IS RUN UNDER // EXEC FORTCALG.
C TPRD IS A MODIFIED VERSION OF TAPRD, WHICH ALLOWS THE USER TO
C READ MAGNETIC TAPE RECORDS WHICH CANNOT BE READ BY STANDARD
C METHODS. TPRD DIFFERS FROM TAPRD ONLY IN THAT IT ALLOWS
C RECORDS TO BE SKIPPED. THIS IS ACCOMPLISHED BY ALTERING THE
C FOLLOWING CARDS:
C
C      CARD NO.        TAPRD VERSION              TPRD VERSION
```

```
C          TPR01430        TAPRD   CSECT                   TPRD   CSECT
C          TPR01910        MVI   TPCCW,X'3F'               MVI   TPCCW,X'37'
C          TPR02990        TAPRD   CSECT                   TPRD   CSECT
C
C       CTHERWISE, THE PROGRAMS ARE IDENTICAL. A LISTING OF TPRD VERSION
C       MINUS THE DOCUMENTATION IS PROVIDED BELOW.  SEE W.R.CHURCH
C       COMPUTER CENTER LIBRARY FOR LISTING OF TAPRD AND APPLICABLE
C       DOCUMENTATION.
C                                                                      1120
      DIMENSION X(4001), Y(4001), LABEL(19), TH(12), DH(12), IREC(1801),  1125
     1 NRCSKP(99), DCON(1), AMONCA(13), EVENT(13), D(1801), T(1801)       1130
      INTEGER B(8001),ZER,DOL,STAR,ONE,FLAG,DLTREC,DLR,BLANK,A(2001),TWO  1135
     1,THREE,FOUR,FIVE,SIX,SEVEN,EIGHT,TEN,ELEVEN,AMONT                   1140
      LCGICAL PRT1,PRT2,PLT1,PLT2,TAPE,ENDFL,CARDS,SKIP                   1145
C       **************************************************************   1150
C                                                                         1155
      NAMELIST /CONTRL/ NN,PRT1,PRT2,PLT1,PLT2,TAPE,ENDFL,CARDS,ISTOP,IP  1160
     1,IH,NRCSKP,NSKP,JSKIP,ISQZ,IDSCL,ICODE,ITSCL,ISCL,XBTCOR,ICSQZ,TCO  1165
     2R/DAT/TH,DH,IH,ICODE,ISCL,ITSCL,IDSCL,IP,IDEN,ISQZ,ITSQZ,ICSQZ,TCO  1170
     3R,IHDR,NOIRG,CARDS,ISTA,DCON,DCOR,SKIP,AMONC,TAPE                   1175
C                                                                         1180
C       **************************************************************   1185
C                                                                         1190
      REAL *8EVENT,WMONTH                                                 1195
      DATA AMONCA/'H','I','C','K','L','O','P','Q','R','U','V','W','Z'/    1200
      DATA EVENT/'AUG 1973','SEP 1973','OCT 1973','NOV 1973','DEC 1973',  1205
     1'JAN 1974','FEB 1974','MAR 1974','APR 1974','MAY 1974','JUN 1974',  1210
     2'JUL 1974','AUG 1974'/                                              1215
C                                                                         1220
C       DEFINE SYMBOLS, NOTEING THAT THE LEFT THREE HEX BYTES IN EACH     1225
C       ELEMENT OF B END UP FILLED WITH BLANKS                            1230
      DATA DOL/'$$$$'/,STAR/Z4040405C/,KEY/Z4040405F/,ONE/Z404040F1/,     1235
     1FLAG/Z40404050/,DLTREC/Z40404060/,MINUS/Z40404061/,                 1240
     2 DLR/Z4040405B/,BLANK/'    '/,ZER/Z404040F0/,TWO/Z404040F2/,        1245
     3THREE/Z404040F3/,FOUR/Z404040F4/,FIVE/Z404040F5/,                   1250
     4MTWO/Z404040E2/,MTHREE/Z404040E3/,MFOUR/Z404040E4/,MFIVE/Z404040E5  1255
     5/,SIX/Z404040F6/,SEVEN/Z404040F7/,EIGHT/Z404040F8/,NINE/Z404040F9   1260
     6/,TEN/Z404040F0/,ELEVEN/Z4040407B/                                  1265
C                                                                         1270
C       **************************************************************   1275
C***(A) INITIALIZE VARIABLES AND ARRAYS.*****************************   1280
C                                                                         1285
C       THE FOLLOWING CONVERSION FACTOR IS IN HUNDREDS OF INCHES PER      1290
C       UNIT OF T. IT MAY BE OVERRIDDEN BY THE DATA CARDS.                1295
      DCON(1) = 1.0475                                                    1300
C                                                                         1305
      DATA CARDS/.FALSE./,DCOR/0.0/,ENDFL/.FALSE./,FG/0./,ICODE/0/,ICSQZ  1310
     1/1/,IDSCL/1/,IH/0/,IHDR/0/,IP/0/,IPS/8000/,ISCL/1/,ISQZ/1/,ISTOP/0  1315
```

```
     2/,ITSCL/1/,ITSQZ/1/,JJJ/0/,JJJJ/0/,JREC/1/,JSAV/0/,KDTH1/1/,KDTH2/     1320
     31/,NE/0/,NOIRG/0/,NSKP/0/,PLT1/.FALSE./,PLT2/.FALSE./,PRT1/.TRUE./     1325
     4,PRT2/.FALSE./,SKIP/.FALSE./,TAPE/.FALSE./,TCOR/0./                    1330
C                                                                             1335
C       GIVE THE ARRAYS INITIAL VALUES                                        1340
C                                                                             1345
C                                                                             1350
C                                                                             1355
      DO 20 J=1,12                                                            1360
      TH(J) = 0.                                                              1365
      DH(J) = 0.                                                              1370
   20 CONTINUE                                                                1375
C                                                                             1380
C                                                                             1385
C                                                                             1390
C                                                                             1395
      DO 30 J=1,1801                                                          1400
      D(J) = 0.                                                               1405
      T(J) = 0.                                                               1410
   30 CONTINUE                                                                1415
C                                                                             1420
C                                                                             1425
C                                                                             1430
C                                                                             1435
      DO 40 J=1,99                                                            1440
      NRCSKP(J) = 0                                                           1445
   40 CONTINUE                                                                1450
C                                                                             1455
C                                                                             1460
C                                                                             1465
      READ (5,CONTRL)                                                         1470
      READ (5,140) LABEL                                                      1475
      WRITE (6,150) LABEL                                                     1480
C       REWIND HERE IF TAPE IS USED. NOTE THAT IF TAPE=T,JCL                  1485
C       MUST BE PROVIDED TO DEFINE IT.                                        1490
      IF (TAPE) REWIND 8                                                      1495
      IF (NSKP.EQ.0) GO TO 110                                                1500
C                                                                             1505
C       ***************************************************************       1510
C***(B) SKIP RECORDS.*****************************************************   1515
C                                                                             1520
C       NOTE: THE PROGRAM DIFFERENTIATES BETWEEN INITIALLY SKIPPED            1525
C       RECORDS (NSKP) AND BAD RECORDS (NRCSKP).  NRCSKP                      1530
C       REQUIRES DATA CARDS FOR BAD RECORDS SKIPPED AND NSKP                  1535
C       DOESN'T. PLUS NRCSKP ONLY SKIPS A SINGLE RECORD FOR EACH              1540
C       VALUE ASSIGNED TO NRCSKP, WHEREAS NSKP SKIPS MULTIPLE                 1545
C       RECORDS (IE. NSKP=40, THE FIRST 40 RECORDS ON THE TAPE                1550
C       WILL BE SKIPPED.) NSKP                                                1555
```

```
C       AS WELL AS THE 10 VALUES OF NRCSKP MUST BE ON THE FIRST                 1560
C       CONTRL CARD ONLY. A SINGLE CONTRL CARD IS READ HERE AT THE              1565
C       START TO SET NSKP AND NRCSKP.                                           1570
C                                                                               1575
C                                                                               1580
C                                                                               1585
C                                                                               1590
        DO 50 IS=1,NSKP                                                         1595
        IIS = IS                                                                1600
C       IPS IS SET NEGATIVE DURING THE SKIP PROCESS. THIS AVOIDS TPRD           1605
C       STOPPING ON UNREADABLE RECORDS. IPS IS THE MAXIMUM NUMBER OF            1610
C       BYTES OF DATA WHICH WILL BE READ FROM ONE RECORD OF DIGITIZER           1615
C       TAPE BY TPRD. IPS/2 IS THE MAXIMUM TOTAL TRAVEL ALONG THE CURVE         1620
C       MEASURED IN HUNDREDTHS OF AN INCH IN THE X AND Y DIRECTIONS             1625
C       SEPARATELY. NO DATA CARDS ARE NEEDED FOR SKIPPED RECORDS.               1630
        IPS = -8000                                                             1635
   50 CALL TPRD (A,IPS,&70,&90)                                                 1640
C                                                                               1645
C                                                                               1650
C                                                                               1655
C       RESET IPS FOR NORMAL TAPE READING                                       1660
        IPS = 8000                                                              1665
        WRITE (6,60) IIS                                                        1670
   60 FORMAT (/5X,I5,' RECORDS SKIPPED'/)                                       1675
        GO TO 110                                                               1680
C                                                                               1685
C       END AND ERROR MESSAGES.  PROGRAM STOPS                                  1690
   70 WRITE (6,80) IIS                                                          1695
   80 FORMAT (/5X,'FOUND END OF FILE ON RECORD',I4,'DURING SKIP PROCESS'        1700
     1 /)                                                                       1705
        GO TO 1370                                                              1710
   90 WRITE (6,100) IIS,A(1),A(2),A(3),A(4)                                     1715
  100 FORMAT (/5X,'READ ERROR ON RECORD',I5,'ERROR STATISTICS ARE: ',4Z8        1720
     1)                                                                         1725
        GO TO 1370                                                              1730
C                                                                               1735
C       REDEFINE LOOP INDEX TO START AT ONE.                                    1740
  110 NNN = NN-NSKP                                                             1745
C                                                                               1750
C       ***************************************************************       1755
C***(C) READ CARDS AND START MAIN LOOP. COUNT RECORDS.*******************       1760
C       ***************************************************************       1765
C***(D) TERMINATE PROGRAM IF ISTOP=1 OR NUMBER OF RECORDS PROCESSED.****       1770
C                                                                               1775
        IT = 1                                                                  1780
  120 IF (IT.GT.NNN) GO TO 1370                                                 1785
        IPS = 8000                                                              1790
        NREC = IT+NSKP                                                          1795
```

```
      WRITE (6,130) NREC                                                    1800
  130 FORMAT (/5X,'LABEL 130 ; START MAIN LOOP.  RECORD NO. ',I3/)          1805
C      THE NUMBER OF RECORDS TREATED IS DETERMINED BY SETTING               1810
C      NN= NUMBER OF RECORDS ON THE CONTRL CARD. OR THE PROGRAM MAY         1815
C      BE STOPPED BY SETTING ISTOP.GT.0 ON THE LABEL CARD.                  1820
C      THE LABEL CARD HAS THE LAST FOUR COLUMNS FOR CONTROL ALTHOUGH        1825
C      ONLY THREE ARE USED HERE. THE 77-TH COLUMN IS JSKIP; IF IT           1830
C      IS ZERO, ONLY TWO CARDS ARE READ. IF IT IS 1 AN ADDITIONAL CARD,     1835
C      AN &CONTRL CARD, CAN ALSO BE READ. THE 78-TH COLUMN IS ISTOP;        1840
C      IF IT IS =1 THE PROGRAM STOPS. THE 79-TH COLUMN IS AMONC;            1845
C      IT IS AN ALPHABETIC CHARACTER THAT DESIGNATES THE MONTH              1850
C      IN WHICH THE DATA WERE TAKEN. NOTE THAT THIS NEEDS TO BE             1855
C      ON THE LAST CARD SET READ BEFORE PRINTING. AMONC MAY ALTERNATELY     1860
C      BE ADDED ON THE &DAT HEADER CARD.                                    1865
      READ (5,140) LABEL,JSKIP,ISTOP,AMONC                                  1870
  140 FORMAT (19A4,2I1,A1)                                                  1875
      IF (ISTOP.GT.0) GO TO 1370                                            1880
      READ (5,DAT)                                                          1885
      WRITE (6,150) LABEL                                                   1890
      WRITE (6,DAT)                                                         1895
C      NORMALLY TWO DATA CARDS ARE EXPECTED TO BE READ PER RECORD,          1900
C      LABEL AND DAT.  LESS FREQUENTLY CHANGED NUMBERS ARE ON CONTRL.       1905
      JJJJ = 0                                                              1910
      NCIRG = 0                                                             1915
      IF (JSKIP.EQ.0) GO TO 160                                             1920
      READ (5,CONTRL)                                                       1925
      WRITE (6,CONTRL)                                                      1930
  150 FORMAT (/5X,19A4/)                                                    1935
C                                                                           1940
C      ***************************************************************      1945
C***(E) HEADER INFO MISSING.*************************************************1950
C                                                                           1955
C      IHDR=1 ON &DAT PROVIDES FOR MISSED HEADER INSERT ALL THE             1960
C      HEADER INFO ON CARDS, BRANCH TO 540 AND THEN RETURN TO START AT      1965
C      120 WITHOUT INCREMENTING THE RECORD COUNT.                           1970
  160 IF (IHDR.EQ.1) GO TO 540                                              1975
  170 CONTINUE                                                              1980
C                                                                           1985
C      DIAGNOSTIC WRITE STATEMENTS FOLLOW:                                  1990
C                                                                           1995
  180 FORMAT (5X,11F7.2/5X,11F7.2/5X,11F7.2/5X,11F7.2/5X,11F7.2/5X,11F7.    2000
     12/5X,11F7.2/5X,11F7.2/5X,3F7.2,60X,I6)                                2005
  190 FORMAT (7X,' JJJ,  NE  ,KDTH1,KDTH2,JJJJ'/4X,5I6)                     2010
      IPLACE = 170                                                          2015
      WRITE (6,180) (D(J),J=1,1801,20),IPLACE                               2020
      WRITE (6,180) (T(J),J=1,1801,20),IPLACE                               2025
      WRITE (6,190) JJJ,NE,KDTH1,KDTH2,JJJJ                                 2030
C---------------------                                                      2035
```

```
C                                                                       2040
C       FILL THE A ARRAY WITH DOLLARS                                   2045
C                                                                       2050
C                                                                       2055
C                                                                       2060
      DO 200 I=1,2001                                                   2065
C      THE 2001 ASSURES THAT THE LAST WORD OF A WILL CONTAIN DOLLARS     2070
C      SINCE WE READ IN ONLY 8000 BYTES OF DATA.                        2075
  200 A(I) = DOL                                                        2080
C                                                                       2085
C                                                                       2090
C                                                                       2095
C       FILL B WITH BLANKS                                              2100
C                                                                       2105
C                                                                       2110
C                                                                       2115
      DO 210 I=1,8000                                                   2120
  210 B(I) = BLANK                                                      2125
C                                                                       2130
C                                                                       2135
C                                                                       2140
C      ***************************************************************  2145
C***(F) SKIP BAD RECORDS.*************************************************2150
C                                                                       2155
C       THE LIST OF BAD RECORDS IS EXAMINED AND SKIPPED.                2160
C       DO NOT REMOVE THE DATA CARDS FOR THE BAD RECORD.                2165
C       NOTE THAT IF NRCSKP(1) IS ZERO, THE TEST IS SKIPPED.            2170
      IF (NRCSKP(1).EQ.0) GO TO 250                                     2175
C                                                                       2180
C                                                                       2185
C                                                                       2190
      DO 220 J=1,99                                                     2195
      NRC = NRCSKP(J)-NSKP                                              2200
      IF (NRC.EQ.IT) GO TO 230                                          2205
  220 CONTINUE                                                          2210
C                                                                       2215
C                                                                       2220
C                                                                       2225
      GO TO 250                                                         2230
C      CHANGING IPS TO NEGATIVE CAUSES TPRD TO SKIP A RECORD            2235
  230 IPS = -8000                                                       2240
  240 FORMAT (//5X,'LABEL 240. RECORD NO.',I5,' SKIPPED VIA NRCSKP SKIP 2245
     1 ROUTINE.'//)                                                     2250
      WRITE (6,240) IT                                                  2255
C                                                                       2260
C      ***************************************************************  2265
C***(G) READ USABLE RECORD INTO A ARRAY.**********************************2270
C                                                                       2275
```

```
  250 CALL TPRD (A,IPS,&280,&260)                                          2280
C                                                                          2285
C       IPS IS THE MAXIMUM SIZE OF THE ORIGINAL BCD RECORD. THIS SIZE      2290
C       / 200 IS THE MAXIMUM DISTANCE THE STYLUS CAN TRAVEL, + AND/OR -,   2295
C       IN EITHER THE X OR THE Y DIRECTION; 60 IS THE END-OF-FILE EXIT,    2300
C       2 IS THE READ-ERROR EXIT.                                          2305
      GO TO 290                                                            2310
  260 WRITE (6,270) A(1),A(2),A(3),A(4)                                    2315
  270 FORMAT (5X,'THE ERROR STATISTICS TABLE IS ',4Z8)                      2320
  280 CONTINUE                                                             2325
  290 CONTINUE                                                             2330
C                                                                          2335
C      ************************************************************        2340
C***(H) MOVE BYTES OF A ARRAY INTO B ARRAY.*****************************   2345
C                                                                          2350
      JJ = 0                                                               2355
      JJJ = 0                                                              2360
C                                                                          2365
C                                                                          2370
C                                                                          2375
      DO 300 II=1,2000                                                     2380
C                                                                          2385
C                                                                          2390
C                                                                          2395
      DO 300 I=1,4                                                         2400
      JJ = JJ+1                                                            2405
      CALL CHMOVE (A(II),I,B(JJ),4)                                        2410
      IF (B(JJ).EQ.DLR) GO TO 310                                          2415
C       END OF DATA DETECTED                                               2420
  300 CONTINUE                                                             2425
C                                                                          2430
C                                                                          2435
  310 CONTINUE                                                             2440
C                                                                          2445
C                                                                          2450
      B(8001) = DLR                                                        2455
C                                                                          2460
C      ************************************************************        2465
C***(I) PROCESS B ARRAY.************************************************   2470
C                                                                          2475
C       A DIAGNOSTIC WRITE STATEMENT FOLLOWS:                              2480
      WRITE (6,320) JJ,(B(J),J=1,25)                                       2485
  320 FORMAT (/5X,'LABEL 320. ARRAY B IS FILLED; LOOK FOR MODE CHARACTER   2490
     1. THE NUMBER OF ARRAY ELEMENTS PROCESSED INCLUDING STARS AND '/      2495
     25X,'DOLLARS, JJ= ',I5,/5X,'FIRST 25 CHARACTERS ARE: ',               2500
     3 10(1X,Z8)/5X,10(1X,Z8)/5X,5(1X,Z8)/)                               2505
C       TEST TO SEE IF THIS IS A KEYBOARD ENTRY OR A STAR (TRACER)         2510
C       AND PERMIT THE POSSIBILITY THAT EITHER 'KEYBOARD' OR 'TRACER'      2515
```

```
C       BUTTONS HAVE BEEN PUSHED TWICE.                                      2520
C                                                                            2525
C       IN USING THE CALMA DIGITIZER, SPURIOUS BLANK RECCRDS WOULD           2530
C       APPEAR AT RANDOM THROUGHOUT THE TAPE. WHEN THESE BLANK RECORDS       2535
C       CCCUR DURING A HEADER RECORD NOTHING IS LOST SINCE HEADER            2540
C       INFO IS EASILY INSERTED VIA DATA CARDS BY SETTING IHDR=1.            2545
C       HOWEVER, IF A BLANK RECORD OCCURS DURING A TRACE RECORD THE          2550
C       COMPLETE STATION IS LOST.  FROM EXPERIENCE A BLANK RECORD            2555
C       NORMALLY WILL HAVE TWO CHARACTERS (IE. JJ=2). AFTER THE FIRST        2560
C       RUN THE BLANK RECORDS CAN BE LOCATED AND CAN THEN BE SKIPPED         2565
C       INDIVIDUALLY OR THE ENTIRE STATION CAN BE SKIPPED DEPENDING          2570
C       CN WHETHER THE BLANK RECORD IS IN THE HEADER OR TRACE.               2575
C       THIS PROBLEM IS SUSPECTED TO BE THE RESULT OF MECHANICAL             2580
C       PROBLEMS WITH THE DIGITIZER ITSELF AND SHOULD NOT BE A               2585
C       RECURRING PROBLEM.                                                   2590
      JJ = 1                                                                 2595
      GO TO 360                                                              2600
C                                                                            2605
C       THE FOLLOWING ROUTINE READS ANOTHER SET OF CARDS.  THIS IS THE       2610
C       ENTRY FOR THE SITUATIONS IN WHICH THE IRG IS MISSED.                 2615
  330 READ (5,140) LABEL,JSKIP,ISTOP,AMONC                                   2620
      IF (ISTOP.GT.0) GO TO 1370                                             2625
      IF (JSKIP.EQ.0) GO TO 340                                              2630
      READ (5,DAT)                                                           2635
      WRITE (6,150) LABEL                                                    2640
      WRITE (6,DAT)                                                          2645
      READ (5,CONTRL)                                                        2650
      WRITE (6,CONTRL)                                                       2655
C       DIAGNOSTIC WRITE STATEMENTS FOLLOW:                                  2660
  340 IPLACE = 185                                                           2665
      WRITE (6,180) (D(J),J=1,1801,20),IPLACE                                2670
      WRITE (6,180) (T(J),J=1,1801,20),IPLACE                                2675
      WRITE (6,190) JJJ,NE,KDTH1,KDTH2,JJJJ                                  2680
C                                                                            2685
      WRITE (6,350) NOIRG,JJJJ                                               2690
  350 FORMAT (/5X,'LABEL 185.  PROCESSING SECOND HALF.  NOIRG=',I3,          2695
     1 'JJJJ=',I5/)                                                          2700
      NCIRG = 0                                                              2705
      JJ = JJJJ                                                              2710
C                                                                            2715
C       INITIALIZE ADDERS,ETC.                                               2720
  360 SUMD = 0.                                                              2725
      SUMT = 0.                                                              2730
      N = 0                                                                  2735
      KL = 0                                                                 2740
C                                                                            2745
C      ***************************************************************       2750
C***(1) DECODE HEADER LABEL.*************************************************2755
```

```
C                                                                       2760
C       DIAGNOSTIC WRITE STATEMENTS FOLLOW:                             2765
  370 FORMAT (/5X,'B(JJ)=',Z8/)                                         2770
  380 FORMAT (5X,I5/)                                                   2775
      WRITE (6,380) JJ                                                  2780
      WRITE (6,370) B(JJ)                                               2785
C       LOOK FOR KEYBOARD SYMBOL.                                       2790
C       CHECK THE FIRST 11 VALUES OF THE B ARRAY FOR A KEYBOARD         2795
C       SYMBOL SINCE IT IS POSSIBLE TO HAVE BAD OR INVALID SYMBOLS AHEAD 2800
C       OF KEYBOARD SYMBOL OF HEADER. IF ALL ELEVEN VALUES ARE NOT KEYS, 2805
C       RESET JJ TO 1 (IE.JJ=JJ-10) AND PROCESS AS A TRACE. HOWEVER     2810
C       IF ONE OF THE VALUES 1 THRU 11 IS A KEY GO TO 264 AND           2815
C       PROCESS AS A HEADER.                                            2820
C       IF A TRACER SYMBOL IMMEDIATELY FOLLOWS A KEY SYMBOL, THE HEADER 2825
C       IS PROBABLY MISSING AND THE SEGMENT IS PROSESSED AS A TRACE.    2830
C       (NOTE 1: IN THE CASE OF A HEADER JJ IS NOT RESET TO 1.          2835
  390 IF (B(JJ).EQ.KEY) GO TO 850                                       2840
      JJ = JJ+1                                                         2845
      IF (B(JJ).EQ.KEY) GO TO 850                                       2850
      JJ = JJ+1                                                         2855
      IF (B(JJ).EQ.KEY) GO TO 850                                       2860
      JJ = JJ+1                                                         2865
      IF (B(JJ).EQ.KEY) GO TO 850                                       2870
      JJ = JJ+1                                                         2875
      IF (B(JJ).EQ.KEY) GO TO 850                                       2880
      JJ = JJ+1                                                         2885
      IF (B(JJ).EQ.KEY) GO TO 850                                       2890
      JJ = JJ+1                                                         2895
      IF (B(JJ).EQ.KEY) GO TO 850                                       2900
      JJ = JJ+1                                                         2905
      IF (B(JJ).EQ.KEY) GO TO 850                                       2910
      JJ = JJ+1                                                         2915
      IF (B(JJ).EQ.KEY) GO TO 850                                       2920
      JJ = JJ+1                                                         2925
      IF (B(JJ).EQ.KEY) GO TO 850                                       2930
      JJ = JJ+1                                                         2935
      IF (B(JJ).EQ.KEY) GO TO 850                                       2940
      JJ = JJ-10                                                        2945
  400 FORMAT (5X,'LABEL 400.',I5)                                       2950
      WRITE (6,400) JJ                                                  2955
      IF (KL.EQ.1) GO TO 430                                            2960
      IF (KL.EQ.2) GO TO 430                                            2965
C       NO KEYBOARD SYMBOL; MAY HAVE FORGOTTEN IT.  TEST THE 5TH AND    2970
C       6TH SYMBOLS (IDEPTH).  IF BOTH ARE NINES CALL IT A KEYBOARD     2975
C       ANYWAY.                                                         2980
      IF (B(5).EQ.NINE.AND.B(6).EQ.NINE) GO TO 410                      2985
      GO TO 590                                                         2990
  410 IJJ = JJ+12                                                       2995
```

```
      WRITE (6,420) (B(I),I=JJ,IJJ)                                     3000
  420 FORMAT (/5X,'AT 410, MISSING KEY.  B(1) TO B(13)=',13A1/)         3005
C                                                                       3010
C      PROCESS KEYBOARD ENTRIES.  CHANGE THE WORDS TO                   3015
C      INTEGER FORM BY SUBTRACTING Z4040F0 AND CREATE MULTI-DIGIT       3020
C      INTEGERS.                                                        3025
C      SKIP=T PERMITS NAMELIST DATA CARDS TO OVERRIDE TAPE HEADING      3030
C      INFO. ALL HEADING DATA MUST THEN BE PUT ON THE CARDS.            3035
  430 IF (SKIP) GO TO 540                                               3040
      ISTAA = 0                                                         3045
      IDENT = 0                                                         3050
C      DEFINE INDICES FOR DECODING THE LABEL                            3055
      KY1 = JJ                                                          3060
      KY2 = KY1+2                                                       3065
      KY3 = KY1+3                                                       3070
      KY4 = KY1+4                                                       3075
      KY5 = KY1+5                                                       3080
      KY6 = KY1+6                                                       3085
      KY7 = KY1+7                                                       3090
      KY8 = KY1+8                                                       3095
      KY9 = KY1+9                                                       3100
      KY10 = KY1+10                                                     3105
      KY11 = KY1+11                                                     3110
C                                                                       3115
C      IF THERE IS A DLTREC IN THE HEADER, IT IS FOUND HERE. READ IN A  3120
C      NEW RECORD, AND USE THE SAME CARDS.                              3125
CCC                                                                     3130
CCC                                                                     3135
C                                                                       3140
      DO 440 J=KY1,KY10                                                 3145
      IF (B(J).EQ.DLTREC) GO TO 450                                     3150
  440 CONTINUE                                                          3155
C                                                                       3160
CCC                                                                     3165
C                                                                       3170
      GO TO 480                                                         3175
  450 WRITE (6,460)                                                     3180
  460 FORMAT (/5X,'DLTREC IN HEADER. REPEAT,USING SAME CARDS.'/)        3185
  470 IT = IT+1                                                         3190
      GO TO 170                                                         3195
C                                                                       3200
C      DO THE CONVERSION, COMPARE WITH VALUES READ FROM THE CARDS,ACCEPT3205
C      THE CARDS.                                                       3210
C                                                                       3215
  480 CONTINUE                                                          3220
C                                                                       3225
CC                                                                      3230
C                                                                       3235
```

```
      DO 490 J=KY1,KY2                                                  3240
      B(J) = B(J)-ZER                                                   3245
      IB = B(J)                                                         3250
  490 ISTAA = ISTAA+IB*10**(KY2-J)                                      3255
C                                                                       3260
CC                                                                      3265
C                                                                       3270
      AMONT = B(KY3)                                                    3275
C                                                                       3280
CC                                                                      3285
C                                                                       3290
      DO 500 J=KY4,KY5                                                  3295
      B(J) = B(J)-ZER                                                   3300
      IB = B(J)                                                         3305
  500 IDENT = IDENT+IB*10**(J-KY4)                                      3310
C                                                                       3315
CC                                                                      3320
C                                                                       3325
      IDSC = B(KY6)-ZER                                                 3330
      ICOD = B(KY7)-ZER                                                 3335
      ITSCL1 = B(KY8)-ZER                                               3340
      ISCL1 = B(KY9)-ZER                                                3345
      IPP = B(KY10)-ZER                                                 3350
C                                                                       3355
C       IF THERE IS A DISAGREEMENT, WRITE A MESSAGE.                    3360
      IF (ISTAA.NE.ISTA) GO TO 520                                      3365
      IF (IDENT.NE.IDEN) GO TO 520                                      3370
      IF (IDSC.NE.IDSCL) GO TO 520                                      3375
      IF (ICOD.NE.ICODE) GO TO 520                                      3380
      IF (ITSCL1.NE.ITSCL) GO TO 520                                    3385
      IF (ISCL1.NE.ISCL) GO TO 520                                      3390
      IF (IPP.NE.IP) GO TO 520                                          3395
  510 FORMAT (5X,'LABEL=510.   CARD INPUTS EQUALLED TAPE HEADER FOR     3400
     1  STATION ',I3,A1/5X,'IDEPTH= ',I3/)                             3405
      WRITE (6,510) ISTA,AMONC,IDEN                                     3410
      GO TO 540                                                         3415
  520 WRITE (6,530) ISTA,AMONC,IDEN,IDSCL,ICODE,ITSCL,ISCL,IP,ISTAA,AMON 3420
     1T,IDENT,IDSC,ICOD,ITSCL1,ISCL1,IPP                                3425
  530 FORMAT (/3X'CARD AND TAPE DISAGREE, CARD ON TOP'/3X,'   ISTA  AMON 3430
     1C IDENT   IDSCL  ICODE  ITSCL   ISCL    IP'/3X,I7,A7,6I7/3X,I7,   3435
     2 A4,I10,5I7/)                                                     3440
C       WRITE THE RESULTS                                               3445
  540 WRITE (6,550) ISTA,AMONC,IDEN                                     3450
  550 FORMAT (5X,'LABEL 550.  HEADER PROCESSING COMPLETE EXCEPT SEARCH  3455
     1  FOR ERRORS ON STATION ',I3,A1/5X,'IDEN= ',I3/)                  3460
C                                                                       3465
C       CONSIDER IT POSSIBLE THAT NO IRG EXISTS AFTER THE HEADER.       3470
C       THE PROGRAM HAS FILLED THE B ARRAY WITH BOTH THE HEADER AND     3475
```

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C       TEMPERATURE TRACE. ASSUME THERE IS A TRACER SYMBOL IN POS-          3480
C       ITION 12. IF THIS IS SO, CONTINUE TO PROCESS THE B ARRAY.          3485
        IF (B(KY11).NE.STAR) GO TO 570                                     3490
        JJJJ = KY11                                                        3495
        WRITE (6,560)                                                      3500
  560 FORMAT (/5X,'NO IRG AFTER HEADER; CONTINUE TO PROCESS B ARRAY.'/)     3505
        GO TO 330                                                          3510
  570 IF (IHDR.EQ.0) GO TO 1360                                            3515
C                                                                          3520
C       THIS BRANCH RETURNS TO 120 IF THE HEADER IS MISSING. SET IHDR=1    3525
C       ON THE CARD.                                                       3530
        WRITE (6,580)                                                      3535
  580 FORMAT (/5X,'HEADER MISSING; INFO INSERTED WITH CARDS.'/)            3540
        IHDR = 0                                                           3545
        GO TO 120                                                          3550
C                                                                          3555
C       ***************************************************************  3560
C***(2) PROCESS TRACE BY SUMMING X AND Y.*****************************     3565
C                                                                          3570
C       THE FOLLOWING PROCEDURE PERMITS THE PRESENCE OF ANY REASONABLE     3575
C       NUMBER OF TRACER SYMBOLS (STAR) INCLUDING NONE.                    3580
  590 NE = 0                                                               3585
        NF = 0                                                             3590
        NSTAR = 0                                                          3595
  600 IF (B(JJ).EQ.STAR) GO TO 620                                         3600
C                                                                          3605
C       COUNT STARS AND WRITE MESSAGE                                      3610
        WRITE (6,610) NSTAR                                                3615
  610 FORMAT (/5X,'START TRACER MODE; NO. OF TRACER SYMBOLS =',I2/)         3620
C       WHEN THERE ARE NO MORE STARS, START TESTING FOR COUNT SYMBOLS ETC  3625
        GO TO 630                                                          3630
  620 JJ = JJ+1                                                            3635
        NSTAR = NSTAR+1                                                    3640
C       CONTINUE TO TEST FOR STARS UNTIL NO MORE APPEAR.                   3645
        GO TO 600                                                          3650
C                                                                          3655
C       THE NEXT BLOCK OF OPERATIONS TO JUST BEYOND 820 LOOPS BACK TO      3660
C       630 CONTINUALLY, TESTING EACH CHARACTER FOR IDENTITY AND           3665
C       CONTINUING TO ADD OR SUBTRACT FROM THE CUMULATIVE Y AND X COUNTS   3670
C       UNTIL A DELETE-RECORD SYMBOL OR A STAR OR A DOLLAR INDICATES       3675
C       THE END OF DATA. THE FLAG IS PLACED AT THE POINT WHERE THE TRACE   3680
C       ACTUALLY BEGINS TO RECORD T VS D. PREVIOUS COUNTS RESULT           3685
C       FROM THE TRACER TRAVELING FROM THE COORDINATE ORIGIN TO THIS       3690
C       POINT.                                                             3695
  630 IF (B(JJ).EQ.ONE) GO TO 650                                          3700
        IF (B(JJ).EQ.BLANK) GO TO 660                                      3705
        IF (B(JJ).EQ.MINUS) GO TO 670                                      3710
        IF (B(JJ).EQ.FLAG) GO TO 820                                       3715
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      IF (B(JJ).EQ.KEY) GO TO 390                                          3720
C      THE NEXT GROUP OF STATEMENTS ALLOW FOR OCCASIONAL COUNTS GREATER     3725
C      THAN + OR - 1.                                                       3730
      IF (B(JJ).EQ.TWO) GO TO 680                                          3735
      IF (B(JJ).EQ.THREE) GO TO 690                                        3740
      IF (B(JJ).EQ.FOUR) GO TO 700                                         3745
      IF (B(JJ).EQ.FIVE) GO TO 710                                         3750
      IF (B(JJ).EQ.SIX) GO TO 720                                          3755
      IF (B(JJ).EQ.SEVEN) GO TO 730                                        3760
      IF (B(JJ).EQ.EIGHT) GO TO 740                                        3765
      IF (B(JJ).EQ.NINE) GO TO 750                                         3770
      IF (B(JJ).EQ.TEN) GO TO 760                                          3775
      IF (B(JJ).EQ.ELEVEN) GO TO 770                                       3780
      IF (B(JJ).EQ.MTWO) GO TO 780                                         3785
      IF (B(JJ).EQ.MTHREE) GO TO 790                                       3790
      IF (B(JJ).EQ.MFOUR) GO TO 800                                        3795
      IF (B(JJ).EQ.MFIVE) GO TO 810                                        3800
      IF (B(JJ).EQ.DLTREC) GO TO 920                                       3805
      WRITE (6,640) B(JJ)                                                  3810
  640 FORMAT (//5X,'SYMBOL NOT RECOGNIZED = ',Z8//)                        3815
C      WE ELIMINATE PRINTING OF THIS STATION AND INITIALIZE VARIABLES       3820
C      IF IP ALSO IS EQUAL TO 1.                                            3825
      IF (IP.EQ.1) GO TO 1330                                              3830
      GO TO 1360                                                           3835
  650 RX = 1.                                                              3840
      GO TO 860                                                            3845
  660 RX = 0.                                                              3850
      GO TO 860                                                            3855
  670 RX = -1.                                                             3860
      GO TO 860                                                            3865
  680 RX = 2.                                                              3870
      GO TO 860                                                            3875
  690 RX = 3.                                                              3880
      GO TO 860                                                            3885
  700 RX = 4.                                                              3890
      GO TO 860                                                            3895
  710 RX = 5.                                                              3900
      GO TO 860                                                            3905
  720 RX = 6.                                                              3910
      GO TO 860                                                            3915
  730 RX = 7.                                                              3920
      GO TO 860                                                            3925
  740 RX = 8.                                                              3930
      GO TO 860                                                            3935
  750 RX = 9.                                                              3940
      GO TO 860                                                            3945
  760 RX = 10.                                                             3950
      GO TO 860                                                            3955
```

```
  770 RX = 11.                                                          3960
      GO TO 860                                                         3965
  780 RX = -2.                                                          3970
      GO TO 860                                                         3975
  790 RX = -3.                                                          3980
      GO TO 860                                                         3985
  800 RX = -4.                                                          3990
      GO TO 860                                                         3995
  810 RX = -5.                                                          4000
      GO TO 860                                                         4005
  820 JJJ = NE                                                          4010
      JJ = JJ+1                                                         4015
      FG = 1                                                            4020
      GO TO 630                                                         4025
C      CHECK HERE FOR MULTIPLE KEYBOARD SYMBOLS. IF NUMBER EXCEEDS      4030
C      EIGHT TERMINATE THE PROGRAM. THE NUMBER EIGHT IS ARBITRARY.      4035
C      SELDOM DOES ONE GET MORE THAN THREE KEYBOARD SYMBOLS ON THE TAPE  4040
C      ACCIDENTALLY.                                                    4045
  830 WRITE (6,840)                                                     4050
  840 FORMAT (5X,'FOUND EIGHT KEYBOARD SYMBOLS IN SEQUENCE.  STOP.')    4055
      GO TO 1360                                                        4060
  850 KL = KL+1                                                         4065
      JJ = JJ+1                                                         4070
      IF (KL.EQ.8) GO TO 830                                            4075
      IF (B(JJ).EQ.STAR) GO TO 590                                      4080
C      TRY AGAIN                                                        4085
      GO TO 390                                                         4090
C                                                                       4095
C      THE ADDING IS DONE HERE AND THE CUMULATIVE SUM STORED, ONE       4100
C      UNIT PER .01 INCH.                                               4105
  860 N = N+1                                                           4110
      NE = N/2                                                          4115
      NF = NE*2                                                         4120
      IF (NF.EQ.N) GO TO 870                                            4125
C      THIS FIDDLING AROUND DETERMINES IF  THE COUNT IS EVEN OR ODD.    4130
C      START COUNTING IN THE ORDER YXYX (BECAUSE THE CHART IS READ      4135
C      SIDEWAYS.  X AND Y IN THIS PROGRAM HAVE THE NORMAL ORIENTATIONS  4140
C      ON THE STRIP CHART.  THEY ARE INVERTED WITH RESPECT TO THE       4145
C      CALMA DIGITIZER. SPECIFICALLY DEPTH DECREASES ALONG THE          4150
C      POSITIVE X AXIS AND TEMP INCREASES ALONG THE POSITIVE Y AXIS     4155
C      ON THE CALMA DIGITIZER.                                          4160
C                                                                       4165
C      IF ODD                                                           4170
      SUMD = SUMD+RX                                                    4175
C      INCREASE THE ODD INDEX TO KEEP IT THE SAME AS THE EVEN.          4180
      NE = NE+1                                                         4185
      Y(NE) = SUMD                                                      4190
      JJ = JJ+1                                                         4195
```

```
      GO TO 880                                                          4200
C                                                                        4205
C      IF EVEN                                                           4210
  870 SUMT = SUMT+RX                                                     4215
      X(NE) = SUMT                                                       4220
      JJ = JJ+1                                                          4225
C      IF A STAR OR DOLLAR IS FOUND, THIS IS THE END OF THE DATA.        4230
  880 IF (B(JJ).EQ.DLR) GO TO 940                                        4235
C      END NORMAL TRACE PROCESSING                                       4240
C                                                                        4245
C      BEGIN TROUBLE SHOOTING                                            4250
C      IF THERE IS NO IRG BETWEEN TRACES BUT THERE IS A TRACER SYMBOL,   4255
C      THE TWO CAN BE SEPARATED BY FIRST SETTING                         4260
C      NOIRG=1, DOING NORMAL PROCESSING ON THE FIRST PART OF THE         4265
C      B ARRAY, READING A NEW SET OF CARDS, AND THEN PROCESSING THE      4270
C      SECOND PART OF B.                                                 4275
      IF (B(JJ).NE.STAR) GO TO 900                                       4280
      NOIRG = 1                                                          4285
C      SAVE THE INDEX OF THE START OF THE SECOND HALF, JJJJ.             4290
      JJJJ = JJ                                                          4295
      WRITE (6,890)                                                      4300
  890 FORMAT (/5X,'FOUND A STAR AT END OF TRACER ASSUME THERE IS NO IRG.  4305
     1'/5X,'PROCESS RECORD IN TWO PARTS, READING CARDS FOR BOTH PARTS.'/ 4310
     2)                                                                  4315
      GO TO 940                                                          4320
  900 IF (B(JJ).NE.KEY) GO TO 630                                        4325
      JJJJ = JJ                                                          4330
      WRITE (6,910)                                                      4335
  910 FORMAT (/5X,'FOUND A KEYBOARD SYMBOL.  PROCESS NEXT PORTION OF B A 4340
     1RRAY AFTER READING NEW CARDS.'/)                                   4345
      NOIRG = 1                                                          4350
      GO TO 940                                                          4355
C                                                                        4360
  920 WRITE (6,930) JJ                                                   4365
  930 FORMAT (5X,'FOUND DELETE RECORD SYMBOL AT JJ= ',I5)                4370
C      IF DELETE RECORD IS FOUND, GO TO 470  AND INCREMENT THE           4375
C      VARIABLE, IT, BUT RETURN TO STATEMENT 170. A NEW SET OF CARDS     4380
C      IS NOT READ BUT THE RECORD COUNT, IT, IS INCREMENTED.             4385
      GO TO 470                                                          4390
  940 JJ = JJ-1                                                          4395
C                                                                        4400
C      END TRACER AND ASSOCIATED TROUBLE SHOOTING                        4405
C                                                                        4410
C      ************************************************************      4415
C***(J) CONVERT X AND Y ARRAYS TO DEPTH AND TEMPERATURE.****************  4420
C                                                                        4425
      WRITE (6,950) JJJ,NE,Y(NE),X(NE)                                   4430
  950 FORMAT (/5X,'LABEL 950.  START CONDENSING UNCONVERTED ARRAY AND CO 4435
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     1NVERTING TO SCIENTIFIC UNITS.'/5X,'THE TRACER ENTERED THE FRAME (F     4440
     2LAG) AT JJJ= ',I5/5X,'THE END OF THE TRACE HAS INDEX NE= ',I5/         4445
     3 5X,'LAST (UNCONVERTED) DEPTH AND TEMP ARE: ',F7.1,2X,F7.1/)           4450
C                                                                            4455
C                                                                            4460
C      CHECK TO SEE IF FLAG WAS FOUND.                                       4465
      IF (FG.EQ.1) GO TO 970                                                 4470
      WRITE (6,960)                                                          4475
  960 FORMAT (/5X,'NO FLAG FOUND; PROCESS ANYWAY.'/)                         4480
  970 WRITE (6,980)                                                          4485
  980 FORMAT (' ')                                                           4490
      FG = 0                                                                 4495
C                                                                            4500
C      THE X AND Y ARRAYS ARE FILLED AND THE START AND END OF THIS BATCH     4505
C      OF DATA ARE LABELED WITH JJJ AND NE. THE ARRAYS ARE INDEXED           4510
C      ON  0.01 INCH DEPTH SPACING. SUBROUTINE CONDNS INTERPOLATES TO        4515
C      FILL ANY BLANK ARRAY POSITIONS.                                       4520
      CALL CONDNS (X,Y,T,JJJ,NE,KDTH1,KDTH2)                                 4525
C                                                                            4530
CC                                                                           4535
C                                                                            4540
      DO 1060 J=KDTH1,KDTH2                                                  4545
      D(J) = (J-1)/DCON(IDSCL)+DCOR                                          4550
C      SUBROUTINE WLQP2, LOCATED IN THE SUBROUTINE LIBRARY OF THE W. R.      4555
C      CHURCH COMPUTER CENTER WAS USED TO DETERMINE THE COEFFICIENTS         4560
C      FOR A BEST FIT SECOND DEGREE POLYNOMIAL THAT DESCRIBED THE            4565
C      RELATIONSHIP BETWEEN THE TEMP AND THE MOVEMENT OF THE STYLUS          4570
C      AS MEASURED IN HUNDREDS OF INCHES.                                    4575
C      A SINGLE POLYNOMIAL DID NOT ACCURATELY DESCRIBE                       4580
C      THIS RELATIONSHIP. IT WAS NECESSARY TO BREAK THE TRACE INTO           4585
C      FIVE SEGMENTS. THE FIRST EQUATION WAS DETERMINED FOR TEMPS FROM       4590
C      1 TO 5 DEG., THE NEXT EQUATION FROM 5 TO 10 DEG., ETC, UP TO A       4595
C      MAXIMUM OF 25 DEG. BY USING SEGMENTS THE EQUATIONS ARE ACCURATE       4600
C      TO WITHIN AT LEAST 0.01 DEG.                                          4605
C                                                                            4610
C      TCOR IS A TEMP CORRECTION WHICH MAY BE APPLIED TO A SINGLE            4615
C      STATION IF NECESSARY. A SINGLE STATION MAY BE IN ERROR DUE            4620
C      TO IMPROPER DIGITIZING TECHNIC. IF THE OPERATOR STARTS TO             4625
C      TRACE AT A POINT WHICH IS NOT THE ORIGIN A CONSTANT CORR. CAN         4630
C      SHIFT THE TRACE BACK TO THE ORIGIN.                                   4635
C      XBTCOR IS A CORRECTION DESIGNED TO MAKE THE XBT READING               4640
C      AGREE WITH A STANDARD, EITHER WITH A NANSEN CAST OR A                 4645
C      STANDARDIZED STD TRACE WHICH WAS MADE AT THE SAME TIME.               4650
C      GENERALLY THE XBT TEMP WAS NOTICABLY HIGHER THAN THE TEMPS            4655
C      RECORDED BY THE OTHER TWO METHODS. THIS CORRECTION ENABLES ONE TO     4660
C      COMPARE TEMPS TAKEN BY DIFFERENT METHODS.                             4665
C                                                                            4670
      IF (T(J).LT.16.6) WRITE (6,990)                                        4675
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```
  990 FORMAT (/5X,'T(J) LESS THEN 1.0 DEG')                                 4680
      IF (T(J).LT.16.6) GO TO 1060                                          4685
      IF (T(J).GT.88.2) GO TO 1000                                          4690
      T(J) = .0509421+.057236*T(J)-.0000125*T(J)*T(J)+TCOR+XBTCOR           4695
      GO TO 1060                                                            4700
 1000 IF (T(J).GT.182.8) GO TO 1010                                         4705
      T(J) = .179875+.0556283*T(J)-.0000104*T(J)*T(J)+TCOR+XBTCOR           4710
      GO TO 1060                                                            4715
 1010 IF (T(J).GT.280.2) GO TO 1020                                         4720
      T(J) = .520519+.0522706*T(J)-.0000021*T(J)*T(J)+TCOR+XBTCOR           4725
      GO TO 1060                                                            4730
 1020 IF (T(J).GT.378.8) GO TO 1030                                         4735
      T(J) = 2.18667+.042103*T(J)+.0000129*T(J)*T(J)+TCOR+XBTCOR            4740
      GO TO 1060                                                            4745
 1030 IF (T(J).GT.475.6) GO TO 1040                                         4750
      T(J) = 2.55982+.0415735*T(J)+.0000118*T(J)*T(J)+TCOR+XBTCOR           4755
      GO TO 1060                                                            4760
 1040 IF (T(J).GT.475.6) WRITE (6,1050)                                     4765
 1050 FORMAT (/5X,' T(J) EXCEEDS 25 DEG.')                                  4770
 1060 CONTINUE                                                              4775
C                                                                           4780
CCC                                                                         4785
CC                                                                          4790
C     **************************************************************        4795
C***(K) MANUALLY INSERT SURFACE AND NEAR SURFACE VALUES.*****************   4800
C                                                                           4805
C       THE T ARRAY IS NOW CONVERTED, AND IT IS NOW NECESSARY               4810
C       TO REINSERT SURFACE AND NEAR SURFACE DATA.  NORMALLY, ONLY          4815
C       SURFACE VALUES  NEED TO BE INSERTED DUE TO THE DIGITIZER OPERATOR   4820
C       BEGINNING HIS TRACING SLIGHTLY BELOW HIS ZERO DEPTH REFERENCE.      4825
C       SURFACE VALUES ARE INSERTED BY CHECKING THE VALUE OF IH.            4830
C       IF IH EQUALS ZERO, NO DATA IS INSERTED MANUALLY. IF IH=1,SURFACE    4835
C       DEPTH AND TEMPERATURE ARE INSERTED VIA &DAT DATA CARD FOR THE       4840
C       PARTICULAR STATION. THIS HAND ENTERED DATA IS STORED IN THE         4845
C       DH AND TH ARRAYS. INFREQUENTLY IT MAY BE NECESSARY TO MANUALLY      4850
C       INSERT DATA VALUES FOR DEPTHS AT NEAR SURFACE.                      4855
C       THIS IS AGAIN NECESSARY ONLY IF THE                                 4860
C       DIGITIZER OPERATOR BEGAN DIGITIZING WELL BELOW THE ZERO DEPTH       4865
C       REFERENCE. SINCE THIS OCCURS INFREQUENTLY AND INVOLVES A SIGNIF-    4870
C       ICANT AMOUNT OF WORK TO MANUALLY INSERT THE DATA VIA CARDS, THIS    4875
C       OPERATION IS PERFORMED ONLY WHEN WRITING THE COMPOSITE TAPE AND     4880
C       CONSEQUENTLY ONLY WHEN ISQZ=1.THUS TO INSERT NEAR SURFACE DATA      4885
C       IHMUSTBEGREATERTHANOREQUALTO2ANDISQZ=1.DHANDTHARE                   4890
C       DIMENSIONED AT 12 , WHICH EQUATES TO APPROXIMATELY 10.5 METERS AT   4895
C       ISQZ=1.  ISQZ=1 WAS CHOSEN BECAUSE ALL OF THE ELEMENTS OF THE D,T   4900
C       ARRAYS ARE PRINTED AS OUTPUT VIA OUT2. THIS ELIMINATES "GUESSWORK   4905
C       WITH RESPECT TO WHICH VALUES NEED TO BE INSERTED, SINCE ALL         4910
C       VALUES ARE INSERTED.  IF THERE IS A GAP BETWEEN HAND ENTERED        4915
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```
C       DATA AND XBT DATA , IT IS NOT FILLED.                                  4920
C                                                                              4925
        IF (IH.EQ.0) GO TO 1080                                                4930
        T(1) = TH(1)                                                           4935
        IF (IH.LT.2) GO TO 1080                                                4940
        IF (ISQZ.GT.1) GO TO 1080                                              4945
C                                                                              4950
C                                                                              4955
C                                                                              4960
        DO 1070 J=2,IH                                                         4965
        D(J) = DH(J)                                                           4970
        T(J) = TH(J)                                                           4975
 1070 CONTINUE                                                                 4980
C                                                                              4985
C                                                                              4990
C                                                                              4995
 1080 CONTINUE                                                                 5000
C                                                                              5005
C       DIAGNOSTIC WRITE STATEMENTS FOLLOW:                                    5010
C--------------------                                                          5015
        IPLACE = 1080                                                          5020
        WRITE (6,180) (D(J),J=1,1801,20),IPLACE                                5025
        WRITE (6,180) (T(J),J=1,1801,20),IPLACE                                5030
        WRITE (6,190) JJJ,NE,KDTH1,KDTH2,JJJJ                                  5035
C--------------------                                                          5040
C                                                                              5045
C        **********************************************************            5050
C***(L) ELIMINATE UNWANTED DATA.*************************************          5055
C                                                                              5060
C       IN DIGITIZING TEMP SEGMENTS ONE FREQUENTLY GETS UNUSUAL VALUES         5065
C       AT THE TOP OR BOTTOM OF THE TRACE SEGMENT (ZERO OR VERY HIGH). IT      5070
C       IS DESIRABLE THAT THESE UNWANTED VALUES BE ELIMINATED PRIOR TO         5075
C       WRITING A TAPE OR PUNCHING CARDS. THUS A CHECK IS MADE TO SEE          5080
C       IF T(J) IS ZERO OR GREATER THAN 25.                                    5085
C                                                                              5090
C       THESE VALUES ARE WRITTEN OUT                                           5095
C       AND COUNTED FOR RECORD PURPOSES BUT ARE DISCARDED FROM THE             5100
C       D AND T ARRAYS. NOTE THE VALUE OF KDTH2, WHICH IS EQUAL TO THE         5105
C       TOTAL NUMBER OF RECORDS, IS REDUCED BY THE NUMBER OF UNWANTED          5110
C       RECORDS.                                                               5115
        K = 0                                                                  5120
        L = 1                                                                  5125
C                                                                              5130
C                                                                              5135
C                                                                              5140
        DO 1110 J=1,KDTH2                                                      5145
        IF ((T(J).EQ.0.0).OR.(T(J).GT.25.0)) GO TO 1090                        5150
        D(L) = D(J)                                                            5155
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      T(L) = T(J)                                                          5160
      L = L+1                                                              5165
      GO TO 1110                                                           5170
 1090 WRITE (6,1100) D(J),T(J),J                                           5175
      K = K+1                                                              5180
      JSAV = K                                                             5185
 1100 FORMAT (//5X,2F7.2,I6,//)                                            5190
 1110 CONTINUE                                                             5195
C                                                                          5200
C                                                                          5205
C                                                                          5210
 1120 FORMAT (//5X,' JSAV=',I6,//)                                         5215
      WRITE (6,1120) JSAV                                                  5220
      KDTH2 = KDTH2-JSAV                                                   5225
C                                                                          5230
C     ****************************************************************     5235
C***(M) GENERATE SERIAL NUMBERS FOR TAPE OUTPUT.************************     5240
C                                                                          5245
C      GENERATE SERIAL NUMBERS FOR THE RECORDS. A RECORD IS                5250
C      EITHER A HEADER FOR A STATION OR THE VALUES  (D AND T) FOR          5255
C      A SINGLE DEPTH.                                                     5260
C                                                                          5265
C                                                                          5270
C                                                                          5275
      DO 1130 J=1,KDTH2                                                    5280
      JREC = JREC+1                                                        5285
      IREC(J) = JREC                                                       5290
 1130 CONTINUE                                                             5295
C                                                                          5300
C                                                                          5305
C                                                                          5310
C     ****************************************************************     5315
C***(N) CONVERT LETTER CODE TO MONTH/YEAR.******************************     5320
C                                                                          5325
C      THIS SECTION CONVERTS THE LETTER DESIGNATOR FOR MONTH (AMONC)       5330
C      FROM THE SINGLE LETTER CODE ON THE DIGITIZED TAPE TO THE            5335
C      APPROPRIATE MONTH AND YEAR IN PREPARATION FOR WRITING THE OUTPUT.   5340
C                                                                          5345
C                                                                          5350
C                                                                          5355
      DO 1140 J=1,13                                                       5360
      IF (AMONC.EQ.AMONCA(J)) GO TO 1160                                   5365
 1140 CONTINUE                                                             5370
C                                                                          5375
C                                                                          5380
C                                                                          5385
 1150 FORMAT (15X,'AMONC NEVER DID EQUAL AMONC(J) CONSEQUENTLY,            5390
     1 WMONTH WILL NOT BE DEFINED'/)                                       5395
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```
      WRITE (6,1150)                                                    5400
      GO TO 1170                                                        5405
 1160 WMONTH = EVENT(J)                                                 5410
 1170 CONTINUE                                                          5415
C                                                                       5420
C      ***************************************************************  5425
C***(O) OUTPUT.*********************************************************5430
C                                                                       5435
C      PRINT DATA                                                       5440
C                                                                       5445
C      THE PARAMETER ISQZ PERMITS CONDENSING THE PRINTED DATA BY THE    5450
C      FACTOR ISQZ                                                      5455
C                                                                       5460
      IF (.NOT.PRT1) GO TO 1190                                         5465
C                                                                       5470
      WRITE (6,1180)                                                    5475
 1180 FORMAT ('1')                                                      5480
      CALL OUT2 (D,T,KDTH2,ISTA,WMONTH,IREC,JREC,ISQZ)                  5485
C                                                                       5490
C      WRITE TAPE                                                       5495
C                                                                       5500
C      TAPE MUST BE TRUE ONLY ONCE, AT THE BEGINNING OF TAPE  WRITING.  5505
C      THE PROGRAM EXPECTS JCL TO WRITE CARD IMAGES ON THE TAPE         5510
C      IN RECORDS 20 DIGITS LONG.                                       5515
 1190 IF (.NOT.TAPE) GO TO 1230                                         5520
C      WRITE THE HEADER INFO HERE.                                      5525
      WRITE (8,1200) ISTA,WMONTH,KDTH2                                  5530
 1200 FORMAT (I4,A9,I6)                                                 5535
      WRITE (8,1210) (D(J),T(J),J=1,KDTH2)                              5540
 1210 FORMAT (F8.2,F6.2)                                                5545
      WRITE (6,1220) ISTA,WMONTH,JREC                                   5550
 1220 FORMAT (5X,'DATA FOR STATION ',I5,A12,' WRITTEN ON TAPE UP TO     5555
     1  RECORD ',I6)                                                    5560
C                                                                       5565
C      PUNCH CARDS                                                      5570
C                                                                       5575
C      COMPRESS THE PUNCHED DATA BY A FACTOR ICSQZ. FORMAT FOR FOUR     5580
C      DATA SETS ON A CARD. NPTS  BECOMES THE NUMBER OF DATA PRINTED    5585
C      IF IT IS EVENLY DIVISIBLE. OTHERWISE THE LAST DATUM IS ALSO      5590
C      PUNCHED. SUPPLY JCL FOR CARD PUNCHING.                           5595
C                                                                       5600
 1230 IF (.NOT.CARDS) GO TO 1330                                        5605
C                                                                       5610
C      THE NUMBER OF POINTS TO BE RETAINED AFTER CONDENSATION IS        5615
C      1+(N-1)/ISQZ. IF THIS DOES NOT COME OUT INTEGRAL ADD THE LAST    5620
C      POINTS.                                                          5625
      NPTS = (KDTH2-1)/ICSQZ                                            5630
      NPT1 = KDTH2-1-ICSQZ*NPTS                                         5635
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      NPTS = NPTS+1                                                          5640
C      WRITE A HEADER CARD                                                   5645
 1240 FORMAT (14X,'OCEANOGRAPHIC DATA FROM U C M II',//)                     5650
 1250 FORMAT (1X,I4,' VALUES OF D,T FOR XBT STA.',I3,A8,'COMPRESSED BY',     5655
     1 I3,/)                                                                 5660
 1260 FORMAT (4X,'DEPTH',2X,'TEMP.',2X,'DEPTH',2X,'TEMP.',2X,'DEPTH',        5665
     1 2X,'TEMP.',2X,'DEPTH',2X,'TEMP.')                                     5670
 1270 FORMAT (4X,'METERS',1X,'DEG.C.',1X,'METERS',1X,'DEG.C.',1X,'METERS     5675
     1',1X,'DEG.C.',1X,'METERS',1X,'DEG.C.',/)                               5680
      WRITE (7,1240)                                                         5685
      WRITE (7,1250) NPTS,ISTA,WMONTH,ICSQZ                                  5690
      WRITE (7,1260)                                                         5695
      WRITE (7,1270)                                                         5700
C      NOW FIND THE NUMBER OF CARDS                                          5705
      NCARDS = NPTS/4                                                        5710
      NCRD1 = NPTS-4*NCARDS                                                  5715
C      THERE WILL BE ONE MORE CARD IF NCRD1.NE.0.                            5720
      INCR = 4*ICSQZ                                                         5725
      J = 1-INCR                                                             5730
      K = 0                                                                  5735
 1280 J = J+INCR                                                             5740
      K = K+1                                                                5745
      J1 = J+ICSQZ                                                           5750
      J2 = J1+ICSQZ                                                          5755
      J3 = J2+ICSQZ                                                          5760
 1290 FORMAT (2X,4(F8.2,F6.2),3X,I3,A10,I6)                                  5765
      WRITE (7,1290) D(J),T(J),D(J1),T(J1),D(J2),T(J2),D(J3),T(J3),ISTA,     5770
     1WMONTH,JREC                                                            5775
      IF (K.LT.NCARDS) GO TO 1280                                            5780
      IF (NCRD1.EQ.0) GO TO 1320                                             5785
C      WRITE THE LAST CARD                                                   5790
      J = J3+ICSQZ                                                           5795
      WRITE (7,1290) D(J),T(J)                                               5800
      IF (J.EQ.KDTH2) GO TO 1320                                             5805
      J = J+ICSQZ                                                            5810
 1300 FORMAT (1H+,16X,F8.2,F6.2)                                             5815
      WRITE (7,1300) D(J),T(J)                                               5820
      IF (J.EQ.KDTH2) GO TO 1320                                             5825
      J = J+ICSQZ                                                            5830
 1310 FORMAT (1H+,30X,F8.2,F6.2)                                             5835
      WRITE (7,1310) D(J),T(J)                                               5840
 1320 CONTINUE                                                               5845
C                                                                           5850
 1330 IF (ENDFL) END FILE 8                                                  5855
C      ENDFL MUST BE TRUE ONCE ON THE LAST TAPE WRITING OPERATION.           5860
C                                                                           5865
C      ***************************************************************      5870
C***(P) INITIALIZE VARIABLES FOR NEXT STATION.**************************     5875
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```
     1 2X,'TEMP.',2X,'DEPTH',2X,'TEMP.')                                    65
  50 FORMAT (4X,'METERS',1X,'DEG.C.',1X,'METERS',1X,'DEG.C.',1X,'METERS     70
     1',1X,'DEG.C.',1X,'METERS',1X,'DEG.C.',/)                              75
       NPTS = NPTS+1                                                        85
       INCR = 4*ISQZ                                                        90
       NPTS = (KDTH2-1)/ISQZ                                                80
       WRITE (6,20)                                                         95
       WRITE (6,30) NPTS,ISTA,WMONTH,ISQZ                                  100
       WRITE (6,40)                                                        105
       WRITE (6,50)                                                        110
C        COMPUTE NUMBER OF FULL LINES                                      115
       NLNS = (KDTH2-1+ISQZ)/INCR                                          120
       NLN1 = KDTH2-1-(4*NLNS-1)*ISQZ                                      125
       J = 1-INCR                                                          130
       K = 0                                                               135
  60   J = J+INCR                                                          140
       K = K+1                                                             145
       J1 = J+ISQZ                                                         150
       J2 = J1+ISQZ                                                        155
       J3 = J2+ISQZ                                                        160
  70   FORMAT (2X,4(F8.2,F6.2),10X,2I6)                                    165
       WRITE (6,70) D(J),T(J),D(J1),T(J1),D(J2),T(J2),D(J3),T(J3),IREC(J)  170
     1,IREC(J3)                                                            175
       IF (K.LT.NLNS) GO TO 60                                             180
C                                                                          185
       IF (NLN1.EQ.0) GO TO 120                                            190
C        WRITE THE LAST LINE                                               195
       J = J3+ISQZ                                                         200
       WRITE (6,70) D(J),T(J)                                              205
       IF (J.EQ.KDTH2) GO TO 110                                           210
       J = J+ISQZ                                                          215
  80   FORMAT (1H+,15X,F8.2,F6.2)                                          220
       WRITE (6,80) D(J),T(J)                                              225
       IF (J.EQ.KDTH2) GO TO 110                                           230
       J = J+ISQZ                                                          235
  90   FORMAT (1H+,29X,F8.2,F6.2)                                          240
       WRITE (6,90) D(J),T(J)                                              245
 100   FORMAT (1H+,73X,I6)                                                 250
 110   WRITE (6,100) IREC(J)                                               255
 120   CONTINUE                                                            260
C                                                                          265
C        COUNT RECORDS                                                     270
 130   FORMAT (//5X,'THIS STATION CONTAINS RECORDS ',I5,' TO ',I5,' INCLU  275
     1SIVE. '/)                                                            280
       WRITE (6,130) IREC(1),JREC                                          285
 140   FORMAT (1H1)                                                        290
       WRITE (6,140)                                                       295
       RETURN                                                              300
```

```
C                                                                       5880
      JREC = JREC+1                                                     5885
C                                                                       5890
C                                                                       5895
C                                                                       5900
      DO 1340 J=1,1801                                                  5905
      D(J) = 0.                                                         5910
      T(J) = 0.                                                         5915
 1340 CONTINUE                                                          5920
C                                                                       5925
C                                                                       5930
C                                                                       5935
C                                                                       5940
      DO 1350 J=1,12                                                    5945
      TH(J) = 0.                                                        5950
      DH(J) = 0.                                                        5955
 1350 CONTINUE                                                          5960
C                                                                       5965
C                                                                       5970
C                                                                       5975
      SKIP = .FALSE.                                                    5980
      ICEN = 0                                                          5985
      IH = 0                                                            5990
      IP = 0                                                            5995
      JSAV = 0                                                          6000
      IF (NOIRG.EQ.1) GO TO 330                                         6005
C                                                                       6010
 1360 IT = IT+1                                                         6015
      GO TO 120                                                         6020
 1370 STOP                                                              6025
      END                                                               6030
```



```
C       ----------SUBROUTINE OUT2 ----------                             5
C       THIS OUTPUT SUBROUTINE FOR DIGIXBT PRINTS DEPTHS AND TEMPS      10
C       FOUR COLUMNS TO A PAGE.                                         15
C                                                                       20
      SUBROUTINE OUT2 (D,T,KDTH2,ISTA,WMONTH,IREC,JREC,ISQZ)            25
      REAL *8WMONTH                                                     30
      DIMENSION D(1801), T(1801), IREC(1801)                            35
C       PRODUCE HEADING                                                 40
   20 FORMAT (14X,'OCEANOGRAPHIC DATA FROM U C M II',//)                45
   30 FORMAT (1X,I4,' VALUES OF D,T FOR XBT STA.',I3,A8,'COMPRESSED BY',50
     1 I3,/)                                                            55
   40 FORMAT (4X,'DEPTH',2X,'TEMP.',2X,'DEPTH',2X,'TEMP.',2X,'DEPTH',   60
```

```
      END
C      ----------SUBROUTINE CONDNS----------
C      THIS SUBROUTINE FINDS THE ARRAY LOCATIONS FOR X, INDEXED
C      SEQUENTIALLY FOR EACH UNIT OF Y.  EACH UNIT OF Y IS 1.0 AND
C      CORRESPONDS TO .01 INCHES OF TRAVEL IN THE DEPTH DIRECTION.
C
      SUBROUTINE CONDNS (X,Y,T,JJJ,NE,KDTH1,KDTH2)
      DIMENSION X(1), Y(1), T(1), KINS(10), KNO(10)
C      IF FIRST INDEX IS ZERO OR NEGATIVE THERE IS A MISBEHAVIOR ELSE-
C      WHERE IN THE PROGRAM.  RESET JJJ TO 1.
      IF (JJJ.GE.1) GO TO 30
      JJJ = 1
      WRITE (6,20)
   20 FORMAT (/5X,'****** JJJ RESET TO ONE - SOMETHING WRONG ******'/)
C      KDTH1 BECOMES THE INDEX OF THE START OF THIS ARRAY SEGMENT.
   30 KDTH1 = Y(JJJ)+1.50
C      BUT IN CASE KDTH1 BECOMES ZERO OR LESS, USE THE START OF THE
C      CURVE AS THE ORIGIN OF INDEXING.
C      THIS CAUSES AN OVERLAP BETWEEN ARRAYS, BUT IT SHOULD BE SMALL.
      XINC = 0.
      IF (KDTH1.GT.0) GO TO 40
      XINC = FLOAT(1-KDTH1)
      KDTH1 = 1
C
   40 JJ1 = JJJ+1
      NE1 = NE-1
C      FORM SUBSCRIPTS FROM THE DEPTH INCREMENTS AND STORE X'S AT THOSE
C      ARRAY LOCATIONS.
C      SEARCH FOR BLANKS IN ARRAY BETWEEN INDEXES KDTH1 AND KDTH2.
C      KCT COUNTS THE NUMBER OF BLANKS
      KCT = 0
      KSAV = KDTH1
C      KINS(J) IS THE NUMBER OF THE ARRAY POSITION FILLED.
CC
CCC
C
      DC 50 J=1,10
      KNO(J) = 0
   50 KINS(J) = 0
C
CC
CCC
C
```

```
      DO 80 J=JJ1,NE1                                                    215
      KDTH = Y(J)+1.50+XINC                                              220
      T(KDTH) = X(J)                                                     225
C      TEST TO SEE IF INDEX IS THE SAME OR ONE GREATER THAN THE LAST     230
C      ONE.  IF NOT, INTERPOLATE VALUES.                                 235
      NREP = KDTH-KSAV                                                   240
      IF (NREP.LE.1) GO TO 70                                            245
      KCT = KCT+1                                                        250
      IF (KCT.GT.10) KCT = 10                                            255
      KNO(KCT) = NREP                                                    260
      KINS(KCT) = KDTH                                                   265
      II = KSAV+1                                                        270
      III = KDTH-1                                                       275
      E = FLOAT(NREP)                                                    280
      G = T(KDTH)                                                        285
      F = G-T(KSAV)                                                      290
C                                                                        295
C                                                                        300
C                                                                        305
      DO 60 I=II,III                                                     310
   60 T(I) = (FLOAT(I-KSAV)/E)*F+G                                       315
C                                                                        320
C                                                                        325
C                                                                        330
   70 KSAV = KDTH                                                        335
   80 CONTINUE                                                           340
C                                                                        345
C                                                                        350
C                                                                        355
      KDTH2 = Y(NE)+1.50+XINC                                            360
C      PUT IN THE FIRST POINT, WHICH OTHERWISE WOULD BE THE LAST         365
C      ONE FOR WHICH Y(J).LT.1.                                          370
      T(KDTH1) = X(JJJ)                                                  375
      T(KDTH2) = X(NE)                                                   380
C      SAVE INDEX OF END OF ARRAY.                                       385
C                                                                        390
C      WRITE DOWN NUMBER AND LOCATIONS OF INTERPOLATED VALUES.           395
      WRITE (6,90) KCT,(KINS(I),I=1,KCT),(KNO(I),I=1,KCT)               400
   90 FORMAT (/5X,'BLANK ARRAY POSITIONS FILLED IN ',I3,' PLACES.  BEGIN 405
     1NING INDEXES AND NO. OF STEPS'/5X,'(10 EACH) ARE: ',5X,10I6/       410
     2 5X,10I6/)                                                         415
      RETURN                                                             420
      END                                                                425
```

```
C      ---------------SUBROUTINE CHMOVE ---------------------------------      5
       SUBROUTINE CHMOVE (A,I,B,J)                                            10
C       THIS SUBROUTINE RETURNS A LOGICAL*1 VARIABLE TO A 4-BYTE ADDRESS      15
C       IN THE MAIN PROGRAM, UNPACKING THE ORIGINAL 4-BYTE WORDS A            20
C       BYTE AT A TIME.                                                       25
       LOGICAL *1A(1),B(1)                                                    30
       B(J) = A(I)                                                            35
       RETURN                                                                 40
       END                                                                    45
```

```
*      ..................................................................  TPR01300
*                                                                          TPR01310
          MACRO                                                           TPR01320
          REGS                                                            TPR01330
          LCLA  &N                                                        TPR01340
          LCLC  &SYM                                                      TPR01350
.LOCP     ANOP                                                            TPR01360
&SYM      SETC  '&N'                                                      TPR01370
R&SYM     EQU   &SYM                                                      TPR01380
&N        SETA  &N+1                                                      TPR01390
          AIF   (&N LT 16).LOOP                                           TPR01400
          MEND                                                            TPR01410
          SPACE 2                                                         TPR01420
TPRD     CSECT                                                            TPR01430
          SPACE 2                                                         TPR01440
          REGS                                                            TPR01450
          SPACE 2                                                         TPR01460
          STM   R14,R12,12(R13)                                           TPR01470
          LR    R12,R15                                                   TPR01480
          USING TPRD,R12                                                  TPR01490
          LA    R11,SAV1        LINK  SAVE REGISTERS                      TPR01500
          ST    R13,4(R11)                                                TPR01510
          ST    R11,8(R13)                                                TPR01520
          LR    R13,R11                                                   TPR01530
          LR    R11,R1           GET ADDRESS OF ARGUMENT LIST             TPR01540
          USING ARGS,R11                                                  TPR01550
          L     R10,AADD                                                  TPR01560
          ST    R10,SHOVAAD      PUT IN LIST FOR SHOVE CALL               TPR01570
          L     R10,ALADD                                                 TPR01580
          L     R10,0(R10)       PUT LENGTH IN SAME LIST                  TPR01590
          ST    R10,SHOVALN                                               TPR01600
          LA    R10,TPDCB                                                 TPR01610
          USING IHADCB,R10                                                TPR01620
          TM    DCBOFLGS,X'10' HAS DCB BEEN OPENED?                       TPR01630
```

```
         BO     OOKK          YES                                                  TPR01640
         TM     BADBOMB,X'AA'  HAS THERE BEEN PREVIOUS CATASTROPHE?                TPR01650
         BNO    ONWITHIT       NOPE, GO AND OPEN IT                                TPR01660
         SPACE  2                                                                  TPR01670
KIKIT    ABEND  3,DUMP         SHOULDNT EVER GET HERE, CRASH                       TPR01680
         SPACE  2                                                                  TPR01690
ONWITHIT OPEN   (TPDCB,INPUT)                                                      TPR01700
         TM     DCBOFLGS,X'10' DID STUPID THING OBEY?                              TPR01710
         BNO    KIKIT           NOPE, GO PUNT                                      TPR01720
         L      R9,DCBDEBAD    GET POINTER AND DEVICE STATISTICS TABLE             TPR01730
         L      R9,32(R9)       GET UCB ADDR OUT OF DEB                            TPR01740
         SR     R6,R6                                                             TPR01750
         IC     R6,9(R9)       GET STAT TABLE POINTER                              TPR01760
         MH     R6,=H'10'      POINTER * 10                                        TPR01770
         L      R9,16          POINTER TO CVT                                      TPR01780
         L      R9,112(R9)     POINTER TO STAT TABLE START                         TPR01790
         LA     R9,0(R6,R9)     GOTCHA STAT TABLE                                  TPR01800
         ST     R9,STATTAB     SAVE ADDRESS OF STAT TABLE                          TPR01810
         MVC    OLDSTAT,0(R9)   SAVE ITS INFO                                      TPR01820
         SPACE  2                                                                  TPR01830
OOKK     L      R0,SHOVALN  GET BLKSIZE FOR TAPE EXCP BUFFER                       TPR01840
         STH    R0,BYTCNT      PUT DATA LENGTH INTO CCW                            TPR01850
         L      R1,SHOVAAD                                                        TPR01860
         ST     R1,TPBUFLOC                                                       TPR01870
         MVC    TPBLOC,TPBUFLOC+1  PUT BUFFER LOC IN CCW                          TPR01880
         LTR    R0,R0                                                             TPR01890
         BP     OOKKK                                                             TPR01900
         MVI    TPCCW,X'37'                                                       TPR01910
         BAL    R9,TPGET                                                          TPR01920
         MVI    TPCCW,X'02'                                                       TPR01930
         BAL    R9,TPWAIT                                                         TPR01940
         B      RETURN                                                            TPR01950
         SPACE  2                                                                  TPR01960
         SPACE  2                                                                  TPR01970
OOKKK    BAL    R9,TPGET       GO READ A BUFFER                                   TPR01980
         SPACE  2                                                                  TPR01990
         BAL   R9,TPWAIT       GO WAIT TILL READ FINISHED                         TPR02000
RETURN   LA     R15,0          NORMAL RETURN, MODIFIED ELSEWHERE                  TPR02010
         L      R13,4(R13)     RESTORE REGISTERS                                  TPR02020
         L      R14,12(R13)                                                       TPR02030
         LM     R0,R12,20(R13)                                                    TPR02040
         BR     R14            ALL RETURNS THRU HERE                              TPR02050
         SPACE  2                                                                  TPR02060
TPEOF    MVI    RETURN+3,X'04'  SET EOF RETURN                                    TPR02070
         SPACE  2                                                                  TPR02080
OUT      CLOSE  TPDCB                                                             TPR02090
         SPACE  2                                                                  TPR02100
         MVI    BADBOMB,X'AA'  TURN ON FLAG                                       TPR02110
```

```
         B      RETURN                                                  TPR02120
         SPACE  2                                                       TPR02130
GETSTAT  L      R9,STATTAB      ARRIVE HERE ON BAD READ                 TPR02140
         MVC    NEWSTAT,0(R9)    GET CURRENT STAT TABLE                 TPR02150
         L      R9,SHOVAAD      MOVE OLD AND NEW STAT TABLES TO FTN     TPR02160
         MVC    0(16,R9),OLDSTAT   ARRAY BEFORE ERROR RETURN           TPR02170
         MVI    RETURN+3,X'08'   SET I/O ERROR RETURN                  TPR02180
         B      OUT                                                     TPR02190
         SPACE  2                                                       TPR02200
TPGET    MVI    TPECB,X'00'     CLEAR ECB                               TPR02210
         MVC    TPEXCP,TPCCW                                            TPR02220
         MVI    RDFLG,X'FF'     TURN ON READ FLAG                       TPR02230
         EXCP   TPIOB           DO IT                                   TPR02240
         BR     R9              RETURN                                  TPR02250
         SPACE  2                                                       TPR02260
TPWAIT   TM     TPECB,X'40'     IS IT ALREADY DONE?                     TPR02270
         BO     NOWAIT          YES                                     TPR02280
         WAIT   ECB=TPECB       NO,WAIT FOR IT                          TPR02290
NOWAIT   CLI    TPECB,X'7F'     DID IT DO IT OK?                        TPR02300
         BE     OK1             YES,CONTINUE                            TPR02310
         SPACE  2                                                       TPR02320
         CLI    TPCSW+3,X'0D'  PROBABLE EOF IF CHAN-DEV END & UNIT EXCPT TPR02330
         BNE    GETSTAT        NOPE, GO FIND ERROR                     TPR02340
         CLI    FLAGS1,X'04'    EXCEPTIONAL CONDIT BIT ON? (=EOF)       TPR02350
         BNE    GETSTAT        NO EOF                                  TPR02360
         L      R1,DCBBLKCT     DECREMENT  DCBBLKCT SO IT MATCHES TAPE  TPR02370
         BCTR   R1,0                TRAILER LABELS                      TPR02380
         ST     R1,DCBBLKCT                                             TPR02390
         EOV    TPDCB          YES,EOF - FORCE CONTROL TO EODAD RTN    TPR02400
         SPACE  2                                                       TPR02410
OK1      BR     R9               RETURN                                 TPR02420
         SPACE  2                                                       TPR02430
SAV1     DC     18F'0'                                                  TPR02440
         SPACE  2                                                       TPR02450
OLDSTAT  DC     D'0'             COPY OF STAT TABLE AFTER OPEN          TPR02460
NEWSTAT  DC     D'0'             COPY OF STAT TABLE UPON ERROR          TPR02470
         SPACE  2                                                       TPR02480
TPEXCP   DC     D'0'           LOC CONTAINING CCW BEING USED            TPR02490
TPCCW    DC     X'02'           READ                                    TPR02500
TPBLOC   DC     AL3(0)          DATA ADDRESS                            TPR02510
FLGS     DC     X'20'           SUPPRESS INCORRECT LNGT                 TPR02520
BYTCNT   DC     H'0'            BYTE COUNT                              TPR02530
         SPACE  2                                                       TPR02540
SHOVSMF  DC     A(0)            LOC OF SMF INFO                         TPR02550
SHOVAAD  DC     A(0)            ADDR OF FORTRAN ARRAY                   TPR02560
SHOVALN  DC     F'0'            BYTE LENGTH OF FORTRAN ARRAY            TPR02570
         SPACE  2                                                       TPR02580
TPBUFLOC DC     A(0)            LOC OF DCBBLKSI LENGTH TAPE BUFFER      TPR02590
```

```
         SPACE 2                                                          TPR02600
STATTAB  DC    A(0)            LOC OF STAT TABLE                         TPR02610
         SPACE 2                                                          TPR02620
         SPACE 2                                                          TPR02630
RDFLG    DC    X'00'            =X'FF' AFTER READ, BEFORE WAIT           TPR02640
BADBOMB  DC    X'00'           FLAG TO TELL WHETHER DCB USED BEFORE      TPR02650
         SPACE 2                                                          TPR02660
TPDCB    DCB   DDNAME=METTAP,MACRF=(E),EODAD=TPEOF,DSORG=PS,             *TPR02670
               IOBAD=TPIOB,DEVD=TA                                        TPR02680
         SPACE 2                                                          TPR02690
         DS    0F                                                         TPR02700
TPIOB    DS    0CL32                                                      TPR02710
FLAGS1   DC    X'00'                                                      TPR02720
FALGS2   DC    X'00'                                                      TPR02730
SENSE1   DC    X'00'                                                      TPR02740
SENS2    DC    X'00'                                                      TPR02750
ECBCOD   DC    X'00'                                                      TPR02760
ECBADD   DC    AL3(TPECB)                                                 TPR02770
FALGS3   DC    X'00'                                                      TPR02780
TPCSW    DC    7X'00'                                                     TPR02790
SIOCODE  DC    X'00'                                                      TPR02800
EXCPADD  DC    AL3(TPEXCP)                                                TPR02810
RESERC   DC    X'00'                                                      TPR02820
DCBADDR  DC    AL3(TPDCB)                                                 TPR02830
REPOMOD  DC    X'00'                                                      TPR02840
RESTADR  DC    AL3(0)                                                     TPR02850
BLCINC   DC    H'1'                                                       TPR02860
ERORCNT  DC    H'0'                                                       TPR02870
         SPACE 2                                                          TPR02880
TPECB    DC    F'0'                                                       TPR02890
         SPACE 2                                                          TPR02900
ARGS     DSECT                                                            TPR02910
AADD     DC    A(0)            ADDRESS OF FORTRAN ARRAY                  TPR02920
ALADD    DC    A(0)            ADDRESS OF LENGTH OF FORTRAN ARRAY        TPR02930
         SPACE 2                                                          TPR02940
         PRINT NOGEN                                                      TPR02950
         DCBD  DSORG=PS,DEVD=TA                                           TPR02960
         PRINT GEN                                                        TPR02970
         SPACE 2                                                          TPR02980
TPRD     CSECT                                                            TPR02990
         LTORG                                                            TPR03000
         END                                                              TPR03010
```

APPENDIX F

```
C  TITLE           XBTPLT                                                      5
CC                                                                            10
C  PROGRAMER       R.E.BLUMBERG                                                15
CC                                                                            20
C  DOCUMENTATION   R.E.BLUMBERG                                                25
CC                                                                            30
C  DATE            12 AUGUST 1975                                              35
CC                                                                            40
C  PURPOSE         XBTPLT IS COMPATIBLE WITH THE FORMAT WRITTEN ON THE 9-       45
CC                  TRACK TAPE BY DIGIXBT. THIS PROGRAM READS DEPTH AND       50
CC                  TEMP DATA FROM THE 9-TRACK TAPE, AND RETAINS THE TEMP,    55
CC                  DEPTH AND STATION NUMBER OF THOSE STATIONS WITH           60
CC                  SUFFICIENT SPECIFIED DEPTH AND WITH THE DESIRED           65
CC                  LOCATION WHICH ARE TO BE PLOTTED. XBTPLT USES             70
CC                  SUBROUTINE CONTUR FROM THE W.R. CHURCH COMPUTER CENTER    75
CC                  SUBROUTINE LIBRARY.                                       80
C  ARGUMENTS       SEE THE SUBROUTINE LIBRARY FOR A DESCRIPTION OF THE         85
CC                  VARIABLES USED IN THE SUBROUTINE CONTUR. THE FOLLOWING    90
CC                  IS A BRIEF DESCRIPTION OF THE IMPORTANT ARRAYS AND        95
CC                  VARIABLES:                                               100
CC                  AM    - THE PLOTTING ARRAY USED IN CONTUR                105
CC                  IFILE- NUMBER OF FILES DESIRED TO BE READ FROM TAPE.     110
CC                  ISTA - ARRAY OF STATION NUMBERS READ AND RETAINED  FOR   115
CC                   PLOTTING.                                               120
CC                  ISTAD- ARRAY USED TO ORDER THE STATIONS FOR PLOTTING.    125
CC                  ISTAP- ARRAY OF REARRANGED STATION NUMBERS.              130
CC                  NFILE- COUNTS NUMBER OF FILES WHICH HAVE BEEN READ FRO   135
CC                   TAPE.                                                   140
CC                  NREC - COUNTS THE NUMBER OF RECORDS PROCESSED.           145
CC                  PD   - DEPTH OF PLOTTING POINT FOR AM ARRAY.             150
CC                  PINC - INCREMENT OF PD.                                  155
CC                  PMONTH- REAL*8 MONTH AND YEAR.                           160
CC                  WMONTH- REAL*8 MONTH AND YEAR ON TAPE.                   165
CC                  TP   - ARRAY OF TEMPS TO BE PLOTTED.                     170
CC                                                                           175
C                                                                            180
      DIMENSION T(400), ISTA(400), AM(13,20), CL(10), TP(400), ISTAP(400     185
     1), ISTAD(17)                                                           190
      LOGICAL *1LTG(3)/.TRUE.,.TRUE.,.FALSE./                                195
      DATA CL/6.5,7.0,7.5,8.0,8.5,9.0,9.5,10.0,11.0,12.0/                    200
      REAL *8WMONTH,PMONTH,TITLE(12)                                         205
      DATA TITLE/'ISOTHERM','S       ',',          ',9*'          '/        210
      DATA ISTAD/317,316,315,314,313,312,311,310,309,308,307,306,305,304     215
     1,303,302,301/                                                          220
```

```
      READ (5,130) PMONTH,IFILE,NSTA,NSKIP1,NSKIP2                      225
C       INITIALIZE VARIABLES.                                           230
      II = 0                                                            235
      NFILE = 0                                                         240
      NREC = 0                                                          245
      PINC = 25.                                                        250
   20 READ (8,140,END=60) ISTAA,WMONTH,JREC                             255
      KOUNT = 0                                                         260
      NREC = NREC+1                                                     265
      PD = 0.                                                           270
C                                                                       275
CC                                                                      280
C                                                                       285
      DO 40 J=1,JREC                                                    290
C       READ THE DEPTH AND TEMP DATA FOR THE ENTIRE STATION ONE AT A TIME 295
CC      THE NEXT SIX 'IF' STATEMENTS CHECK THE DATA TO SEE IF IT IS TO BE 300
C       PLOTTED.                                                        305
      READ (8,150) DE,TE                                                310
      IF ((ISTAA.LT.300).OR.(ISTAA.GT.400)) GO TO 40                    315
      IF (ISTAA.EQ.309) GO TO 40                                        320
      IF ((NREC.EQ.NSKIP1).OR.(NREC.EQ.NSKIP2)) GO TO 40                325
      IF (WMONTH.NE.PMONTH) GO TO 40                                    330
      IF (DE.GT.300.) GO TO 40                                          335
      IF (DE.GE.PD) GO TO 30                                            340
      GO TO 40                                                          345
C       STORE THE DESIRED DATA FOR PLOTTING UNTIL ALL DATA POINTS HAVE  350
C       HAVE BEEN READ.                                                 355
   30 II = II+1                                                         360
      KOUNT = KOUNT+1                                                   365
      T(II) = TE                                                        370
      ISTA(II) = ISTAA                                                  375
      PD = PD+PINC                                                      380
      IF (PD.EQ.300.) PD = 295.                                         385
      TITLE(3) = WMONTH                                                 390
   40 CONTINUE                                                          395
C                                                                       400
CC                                                                      405
C                                                                       410
      WRITE (6,190) KOUNT,NREC                                          415
      IF (KOUNT.LT.13) GO TO 50                                         420
      GO TO 20                                                          425
   50 II = II-KOUNT                                                     430
      WRITE (6,160) ISTAA                                               435
      GO TO 20                                                          440
   60 CONTINUE                                                          445
C       SEE IF MORE THAN ONE FILE IS TO BE READ FROM THE TAPE.          450
      NFILE = NFILE+1                                                   455
      IF (NFILE.LT.IFILE) GO TO 20                                      460
```

```
      WRITE (6,170)                                                          465
      WRITE (6,200) TITLE(3)                                                 470
      K = 0                                                                  475
C                                                                            480
CCC                                                                          485
CCC    REARRANGE THE DATA FOR PLOTTING SUCH THAT THE STATION NUMBERS ARE     490
CCC    ORDERED FROM THE HIGHEST TO THE LOWEST. THIS WILL PUT THE             495
CCC    STATIONS IN ORDER FROM WEST TO EAST.                                  500
C                                                                            505
      DO 90 I=1,17                                                           510
C                                                                            515
CCC                                                                          520
C                                                                            525
      DO 80 J=1,II                                                           530
      IF (ISTA(J).EQ.ISTAD(I)) GO TO 70                                      535
      GO TO 80                                                               540
   70 K = K+1                                                                545
      TP(K) = T(J)                                                           550
      ISTAP(K) = ISTA(J)                                                     555
   80 CONTINUE                                                               560
C                                                                            565
CCC                                                                          570
C                                                                            575
   90 CONTINUE                                                               580
C                                                                            585
CCC                                                                          590
CCC    INITIALIZE THE PLOTTING ARRAY.                                        595
CCC                                                                          600
CCC                                                                          605
C                                                                            610
      DO 100 I=1,13                                                          615
C                                                                            620
CCC                                                                          625
C                                                                            630
      DO 100 J=1,20                                                          635
      AM(I,J) = 0.                                                           640
  100 CONTINUE                                                               645
C                                                                            650
CCC                                                                          655
CCC                                                                          660
C     FILL THE PLOTTING ARRAY WITH THE DATA POINTS.                          665
      K = 0                                                                  670
C                                                                            675
CCC                                                                          680
C                                                                            685
      DO 120 J=1,NSTA                                                        690
C                                                                            695
                                                                             700
```

```
C                                                                       705
C                                                                       710
      DO 110 I=1,13                                                     715
      K = K+1                                                           720
      AM(I,J) = TP(K)                                                   725
  110 CONTINUE                                                          730
C                                                                       735
CC                                                                      740
C                                                                       745
  120 CONTINUE                                                          750
C                                                                       755
CC                                                                      760
C                                                                       765
      WRITE (6,180) ((AM(I,J),J=1,NSTA),I=1,13)                         770
      CALL CONTUR (AM,13,NSTA,13,CL,10,TITLE,8,3,LTG)                   775
      STOP                                                              780
C                                                                       785
CC                                                                      790
C                                                                       795
  130 FORMAT (3X,A9,I2,3I3)                                             800
  140 FORMAT (I4,A9,I6,1X)                                              805
  150 FORMAT (F8.2,F6.2,6X)                                             810
  160 FORMAT (3X,'STATION',I6,' IS LESS THAN 295 METERS DEEP')          815
  170 FORMAT (3X,'THIS IS END OF TAPE READ')                            820
  180 FORMAT (3X,15F8.3)                                                825
  190 FORMAT (3X,'KOUNT=',I5,3X,'NREC=',I5)                             830
  200 FORMAT (75X,A8//)                                                 835
      END                                                               840
```

A P P E N D I X G

```
C TITLE          STDPLT                                                      5
CC                                                                          10
CC PROGRAMER     R.E.BLUMBERG                                               15
CC                                                                          20
CC DOCUMENTATION R.E.BLUMBERG                                               25
CC                                                                          30
CC DATE          12 AUGUST 1975                                             35
CC                                                                          40
CC PURPOSE       STDPLT IS COMPATIBLE WITH THE FORMAT WRITTEN ON THE 9-      45
CC                TRACK TAPE BY DIGISTD. THIS PROGRAM READS DEPTH,          50
CC                TEMP, AND SALINITY DATA FROM THE 9-TRACK TAPE, AND        55
CC                RETAINS THE TEMP, DEPTH, AND STATION NUMBER OF THOSE      60
CC                STATIONS WITH SUFFICIENT SPECIFIED DEPTH AND WITH THE     65
CC                DESIRED LOCATION  WHICH ARE TO BE PLOTTED. STDPLT USES    70
CC                SUBROUTINE CONTUR FROM THE W.R. CHURCH COMPUTER CENTER    75
CC                SUBROUTINE LIBRARY.                                       80
CC ARGUMENTS     SEE THE SUBROUTINE LIBRARY FOR A DESCRIPTION OF THE        85
CC                VARIABLES USED IN THE SUBROUTINE CONTUR. THE FOLLOWING    90
CC                IS A BRIEF DESCRIPTION OF THE IMPORTANT ARRAYS AND        95
CC                VARIABLES:                                               100
CC                AM    - THE PLOTTING ARRAY USED IN CONTUR                105
CC                IFILE- NUMBER OF FILES DESIRED TO BE READ FROM TAPE.     110
CC                ISTA - ARRAY OF STATION NUMBERS READ AND RETAINED  FOR   115
CC                 PLOTTING.                                               120
CC                ISTAD- ARRAY USED TO ORDER THE STATIONS FOR PLOTTING.    125
CC                ISTAP- ARRAY OF REARRANGED STATION NUMBERS.              130
CC                NFILE- COUNTS NUMBER OF FILES WHICH HAVE BEEN READ FRO   135
CC                 TAPE.                                                   140
CC                NREC - COUNTS THE NUMBER OF RECCRDS PROCESSED.           145
CC                PD   - DEPTH OF PLOTTING POINT FOR AM ARRAY.             150
CC                PINC - INCREMENT OF PD.                                  155
CC                PMONTH- REAL*8 MONTH AND YEAR.                           160
CC                WMONTH- REAL*8 MONTH AND YEAR ON TAPE.                   165
CC                TP   - ARRAY OF TEMPS TO BE PLOTTED.                     170
CC                                                                         175
C                                                                          180
      DIMENSION SIGMT(400), SIGMP(400), T(400), ISTA(400), ISTAD(17), AM   185
     1(20,20), BM(20,20), CL(10), DL(5), TP(400), ISTAP(400)               190
      LCGICAL *1LTG(3)/.TRUE.,.TRUE.,.FALSE./                              195
      REAL *8WMONTH,PMONTH,TITLE(12),BTITL(12)                             200
      DATA CL/6.5,7.0,7.5,8.0,8.5,9.0,9.5,10.0,11.0,12.0/,DL/26.1,26.3,2   205
     16.5,26.7,26.9/                                                       210
      DATA TITLE/'ISOTHERM','S       ','          ',9*'          '/       215
      DATA BTITL/'CONSTANT',' SIGMA T',' SURFACE','S       ','          ', 220
```

```
     17*'          '/                                                        225
      DATA ISTAD/317,316,315,314,313,312,311,310,309,308,307,306,305,304     230
     1,303,302,301/                                                         235
      READ (5,130) PMONTH,IFILE,NSTA,NSKIP1,NSKIP2                          240
C       INITIALIZE VARIABLES.                                               245
      II = 0                                                                250
      NFILE = 0                                                             255
      NREC = 0                                                              260
      PINC = 25.                                                            265
   20 READ (8,140,END=60) ISTAA,WMONTH,JREC                                 270
      KOUNT = 0                                                             275
      NREC = NREC+1                                                         280
      PD = 0.                                                               285
C                                                                           290
CC                                                                          295
C                                                                           300
      DO 40 J=1,JREC                                                        305
C       READ THE D,T,S,SIGMA T, SV DATA FOR THE ENTIRE STATION ONE AT A     310
CC      TIME. THE NEXT SIX 'IF' STATEMENTS CHECK THE DATA TO SEE IF IT IS   315
C       TO BE PLOTTED.                                                      320
      READ (8,150) DE,TE,SA,SV,SIGMA                                        325
      IF ((ISTAA.LT.300).OR.(ISTAA.GT.400)) GO TO 40                        330
      IF ((NREC.EQ.NSKIP1).OR.(NREC.EQ.NSKIP2)) GO TO 40                    335
      IF (WMONTH.NE.PMONTH) GO TO 40                                        340
      IF (DE.GT.500.) GO TO 40                                              345
      IF (DE.GE.PD) GO TO 30                                                350
C       STORE THE DESIRED DATA FOR PLOTTING UNTIL ALL DATA POINTS HAVE      355
C       HAVE BEEN READ.                                                     360
      GO TO 40                                                              365
   30 II = II+1                                                             370
      KOUNT = KOUNT+1                                                       375
      ISTA(II) = ISTAA                                                      380
      T(II) = TE                                                            385
      SIGMT(II) = SIGMA                                                     390
      PD = PD+PINC                                                          395
      TITLE(3) = WMONTH                                                     400
      BTITL(5) = WMONTH                                                     405
   40 CONTINUE                                                              410
C                                                                           415
CC                                                                          420
C                                                                           425
      WRITE (6,200) KOUNT,NREC                                              430
      IF (KOUNT.LT.20) GO TO 50                                             435
      GO TO 20                                                              440
   50 II = II-KOUNT                                                         445
      WRITE (6,160) ISTAA                                                   450
      GO TO 20                                                              455
   60 CONTINUE                                                              460
```

```
C       SEE IF MORE THAN ONE FILE IS TO BE READ FROM THE TAPE.                  465
        NFILE = NFILE+1                                                         470
        IF (NFILE.LT.IFILE) GO TO 20                                            475
        WRITE (6,170)                                                           480
        WRITE (6,210) TITLE(3)                                                  485
        K = 0                                                                   490
C                                                                               495
CC                                                                              500
CCC     REARRANGE THE DATA FOR PLOTTING SUCH THAT THE STATION NUMBERS ARE       505
CCC     ORDERED FROM THE HIGHEST TO THE LOWEST. THIS WILL PUT THE               510
CCC     STATIONS IN ORDER FROM WEST TO EAST.                                    515
C                                                                               520
        DO 90 I=1,17                                                            525
C                                                                               530
CCC                                                                             535
C                                                                               540
        DO 80 J=1,II                                                            545
        IF (ISTA(J).EQ.ISTAD(I)) GO TO 70                                       550
        GO TO 80                                                                555
   70   K = K+1                                                                 560
        ISTAP(K) = ISTA(J)                                                      565
        TP(K) = T(J)                                                            570
        SIGMP(K) = SIGMT(J)                                                     575
   80   CONTINUE                                                                580
C                                                                               585
CC                                                                              590
C                                                                               595
   90   CONTINUE                                                                600
C                                                                               605
CC                                                                              610
CCC                                                                             615
CCCCC   INITIALIZE THE PLOTTING ARRAY.                                          620
CCCCC                                                                           625
C                                                                               630
CCC                                                                             635
        DO 100 I=1,20                                                           640
C                                                                               645
CCC                                                                             650
C                                                                               655
        DO 100 J=1,20                                                           660
        AM(I,J) = 0.                                                            665
        BM(I,J) = 0.                                                            670
  100   CONTINUE                                                                675
C                                                                               680
CC                                                                              685
CC                                                                              690
C       FILL THE PLOTTING ARRAY WITH THE DATA POINTS.                           695
        K = 0                                                                   700
```

```
C                                                                       705
CCC                                                                     710
C                                                                       715
      DO 120 J=1,NSTA                                                   720
C                                                                       725
CCC                                                                     730
C                                                                       735
      DO 110 I=1,20                                                     740
      K = K+1                                                           745
      AM(I,J) = TP(K)                                                   750
      BM(I,J) = SIGMP(K)                                                755
  110 CONTINUE                                                          760
C                                                                       765
CCC                                                                     770
C                                                                       775
  120 CONTINUE                                                          780
C                                                                       785
CCC                                                                     790
C                                                                       795
      WRITE (6,180) ((AM(I,J),J=1,NSTA),I=1,20)                         800
      CALL CONTUR (AM,20,NSTA,20,CL,10,TITLE,8,5,LTG)                   805
C      CONTUR IS CALLED THIS SECOND TIME TO PLOT LINES OF CONSTANT       810
CC     SIGMA T. THIS ALLOWS THE OPERATOR TO MANUALLY TRACE THE           815
CCC    SIGMA T SURFACES ONTO THE GRAPH OF THE ISOTHERMS AT A LATER TIME. 820
CCC    THIS IS NECESSARY SINCE ONE IS UNABLE TO DRAW BOTH ISOTHERMS AND  825
C      SIGMA T ON THE SAME GRAPH USING THIS SUBROUTINE.                  830
      WRITE (6,190) ((BM(I,J),J=1,NSTA),I=1,20)                         835
      CALL CONTUR (BM,20,NSTA,20,DL,5,BTITL,8,5,LTG)                    840
      STOP                                                              845
C                                                                       850
CCC                                                                     855
C                                                                       860
  130 FORMAT (A12,I2,3I3)                                               865
  140 FORMAT (I5,A12,I6,17X)                                            870
  150 FORMAT (F6.2,2F6.3,F7.2,F7.4,8X)                                  875
  160 FORMAT (3X,'STATION',I6,' IS LESS THAN 475 METERS DEEP')          880
  170 FORMAT (3X,'THIS IS END OF TAPE READ')                            885
  180 FORMAT (3X,16F8.3)                                                890
  190 FORMAT (3X,16F8.4)                                                895
  200 FORMAT (3X,'KOUNT=',I5,3X,'NREC=',I5)                             900
  210 FORMAT (75X,A8//)                                                 905
      END                                                               910
```

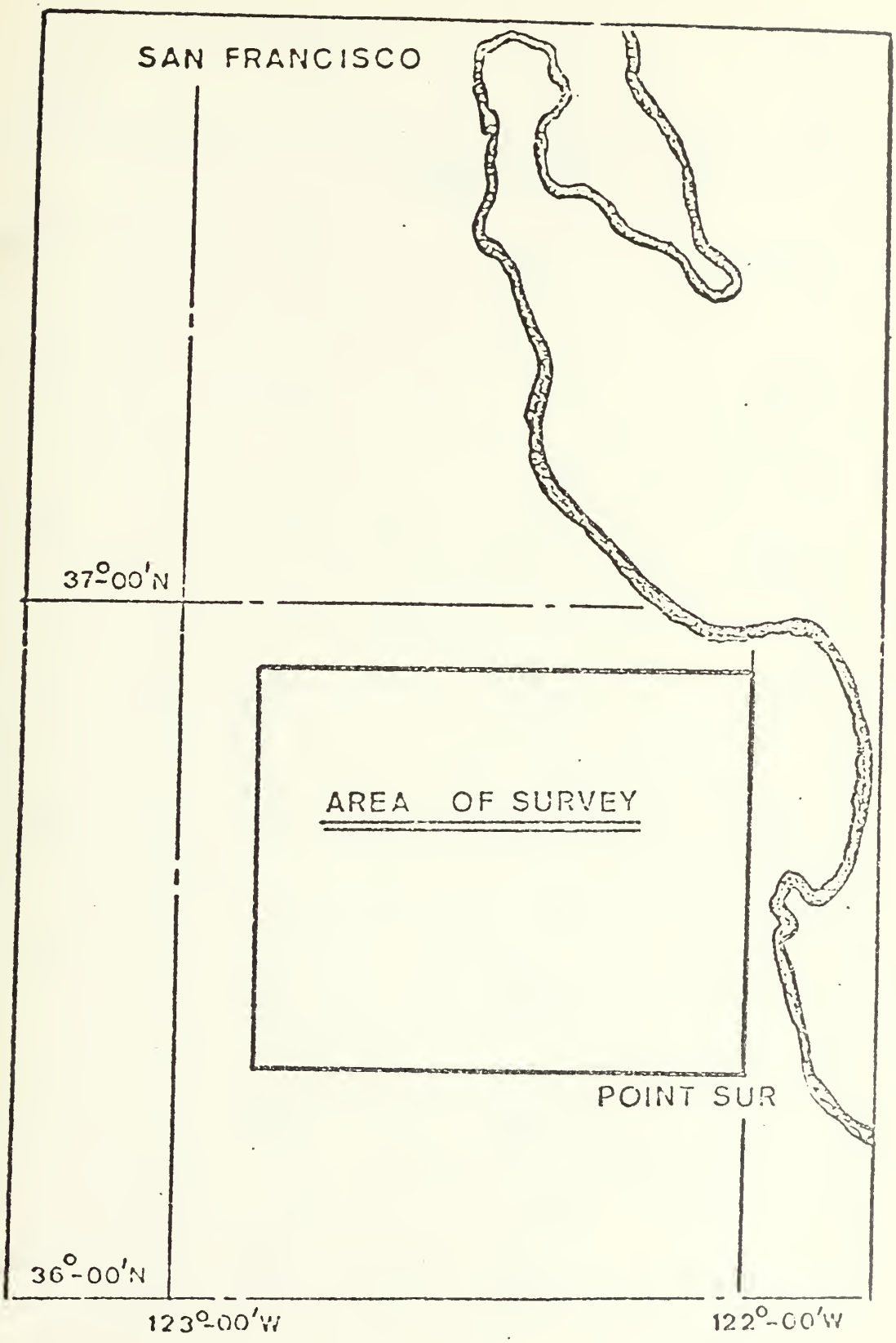

Fig. 1 Area of Survey.

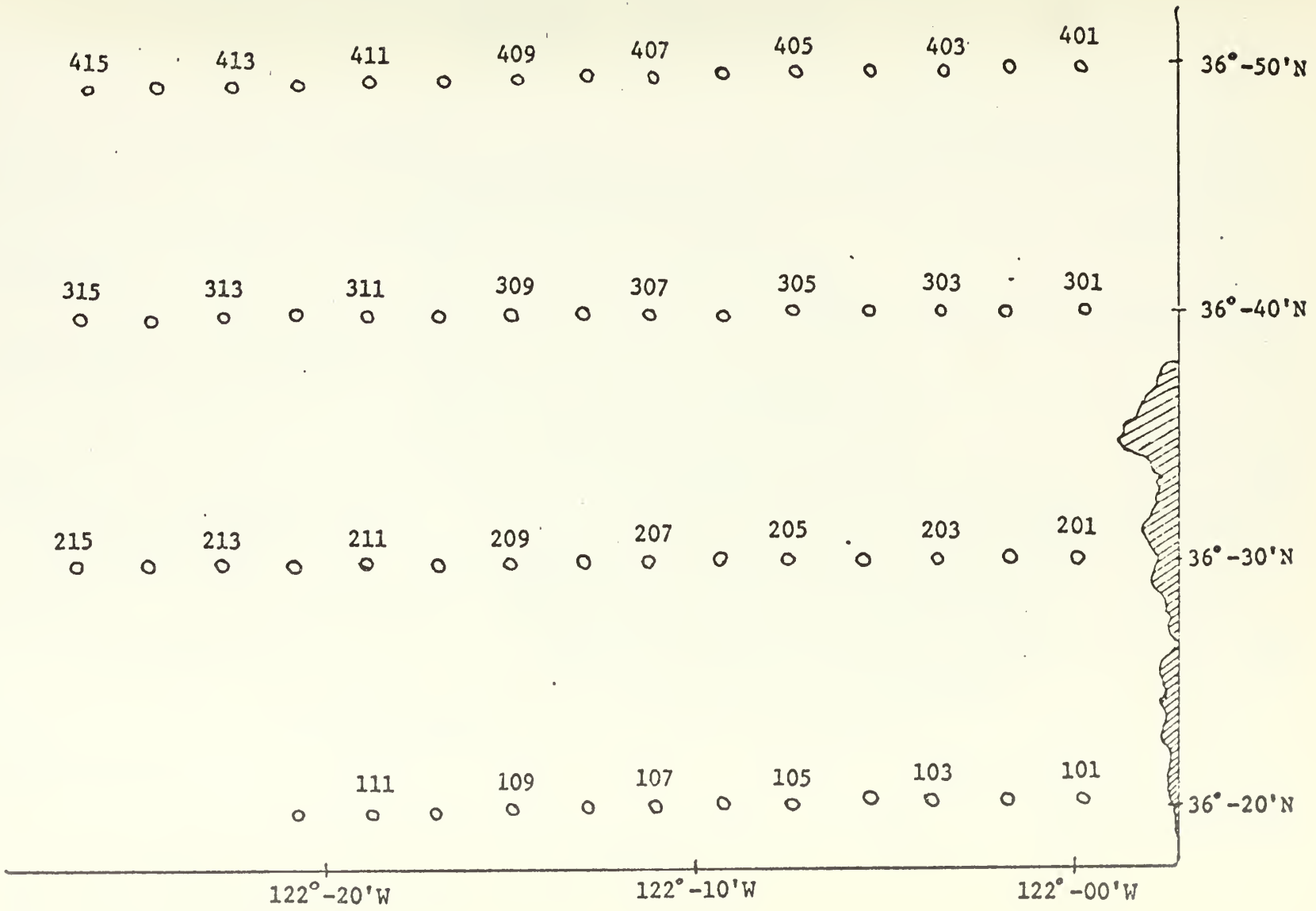

Fig. 2 Station Locations.

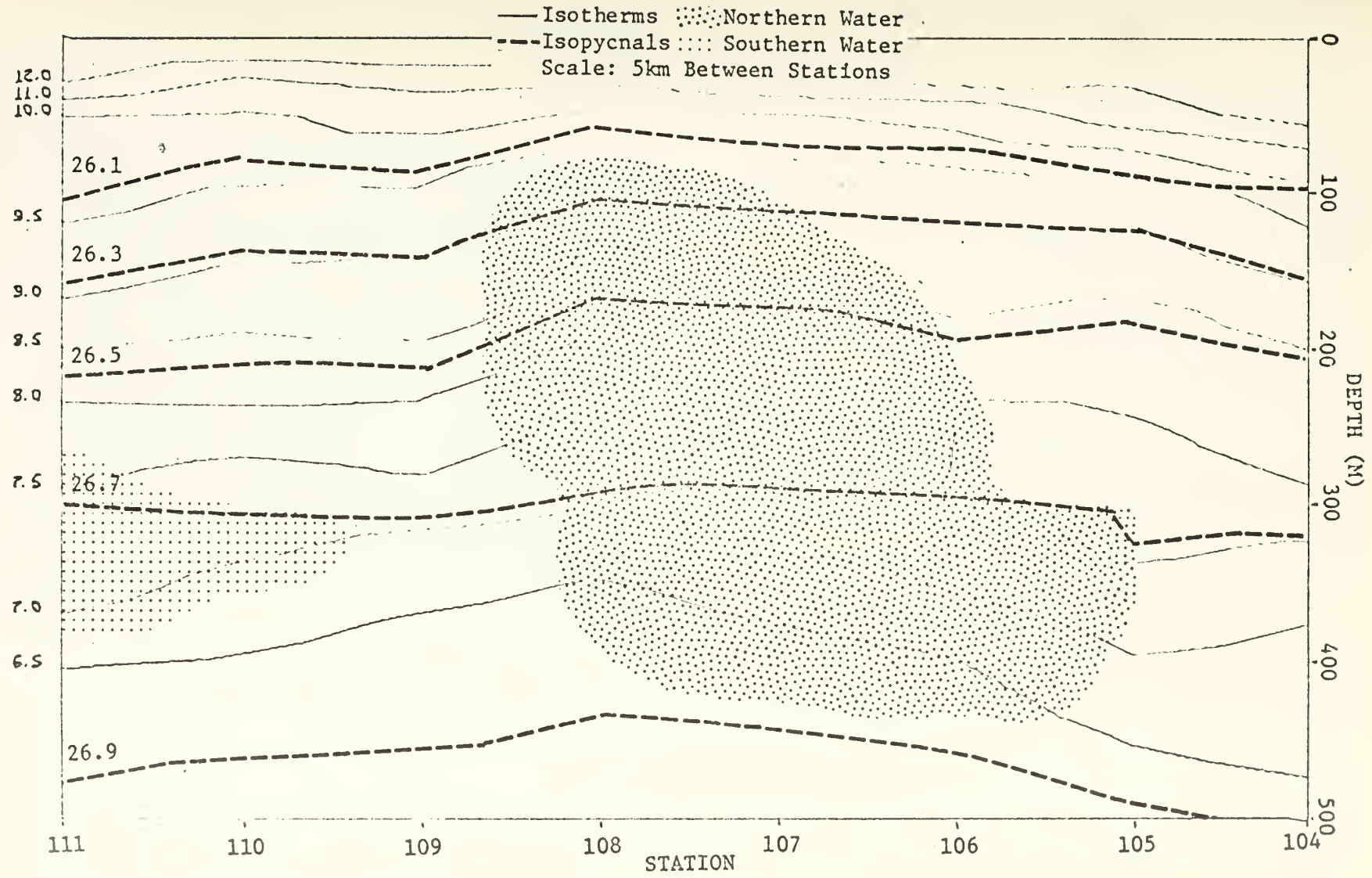

Fig. 3 Isotherms and Constant Sigma t Surfaces, Aug 1973.

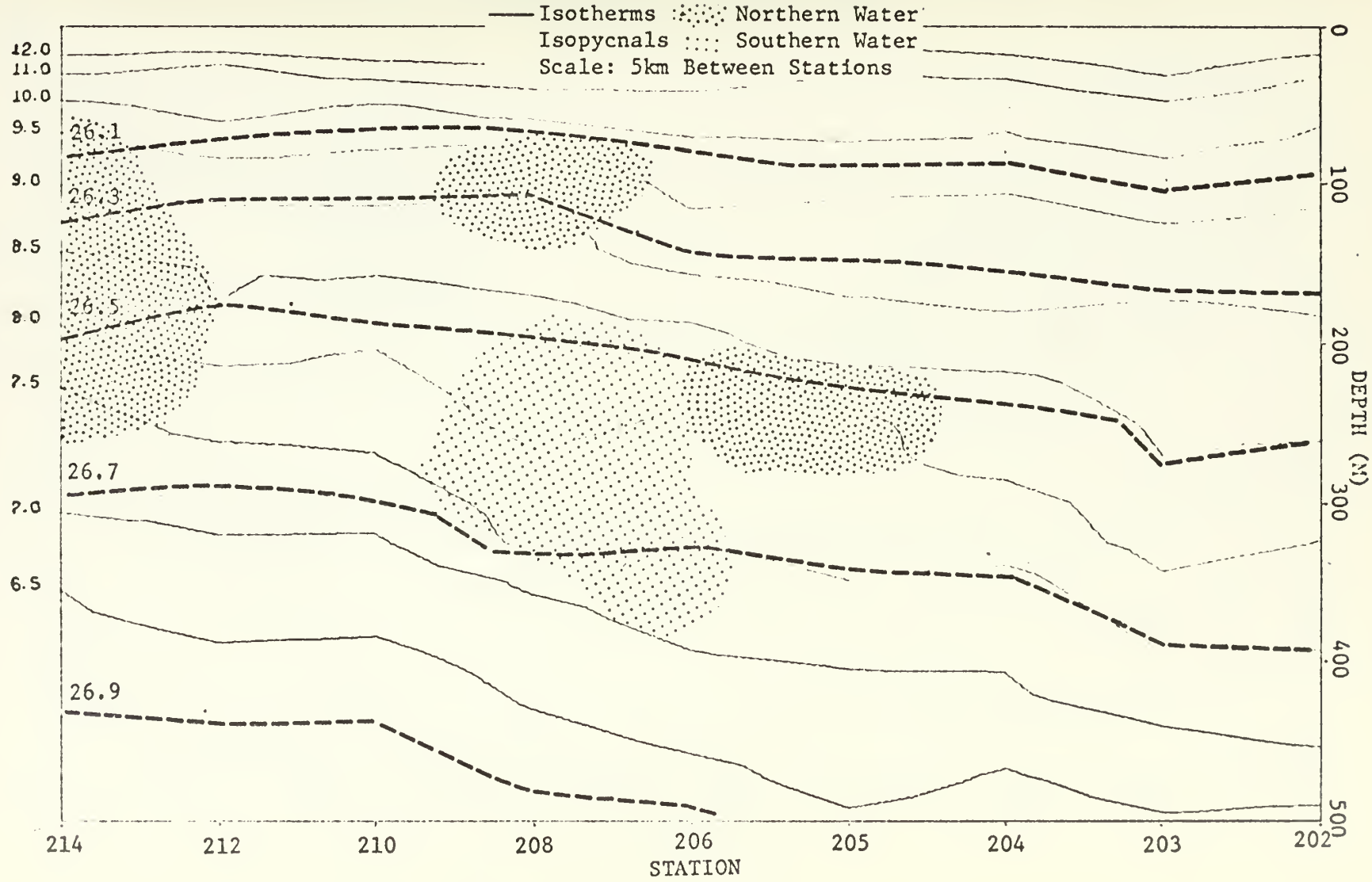

Fig. 4 Isotherms and Constant Sigma t Surfaces, Aug 1973.

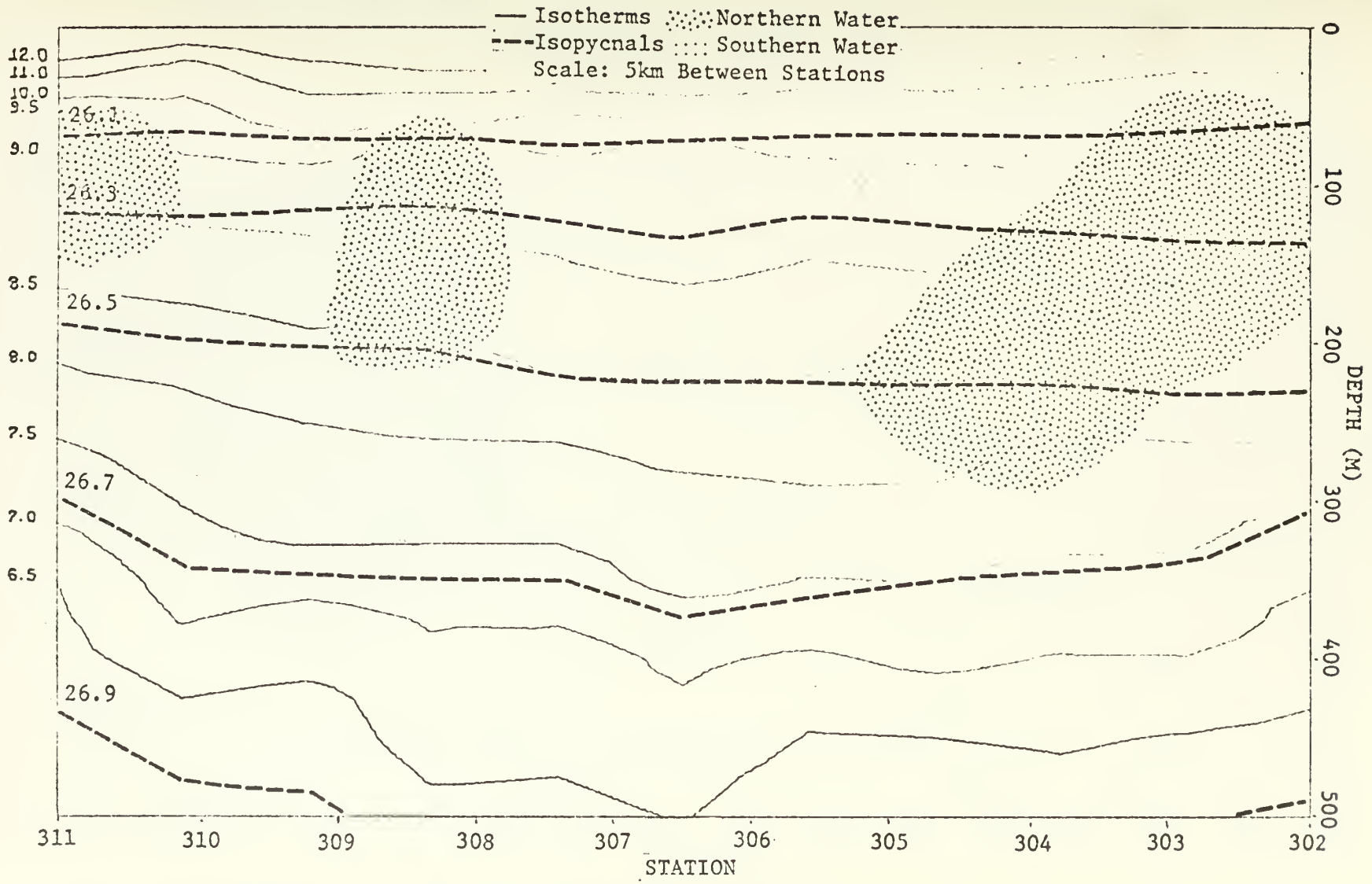

Fig. 5 Isotherms and Constant Sigma t Surfaces, Aug 1973.

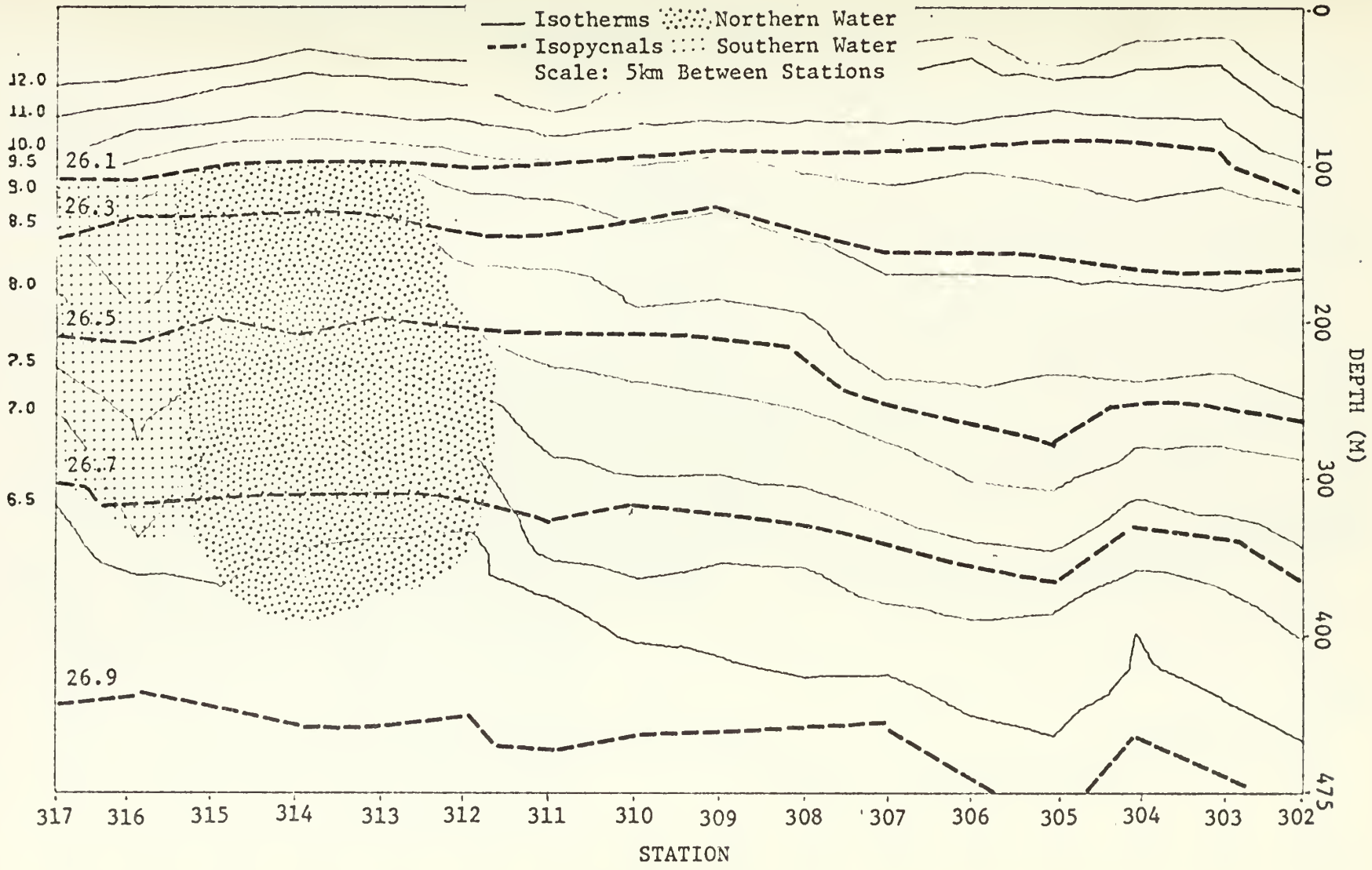

Fig. 6 Isotherms and Constant Sigma t Surfaces, Oct 1973.

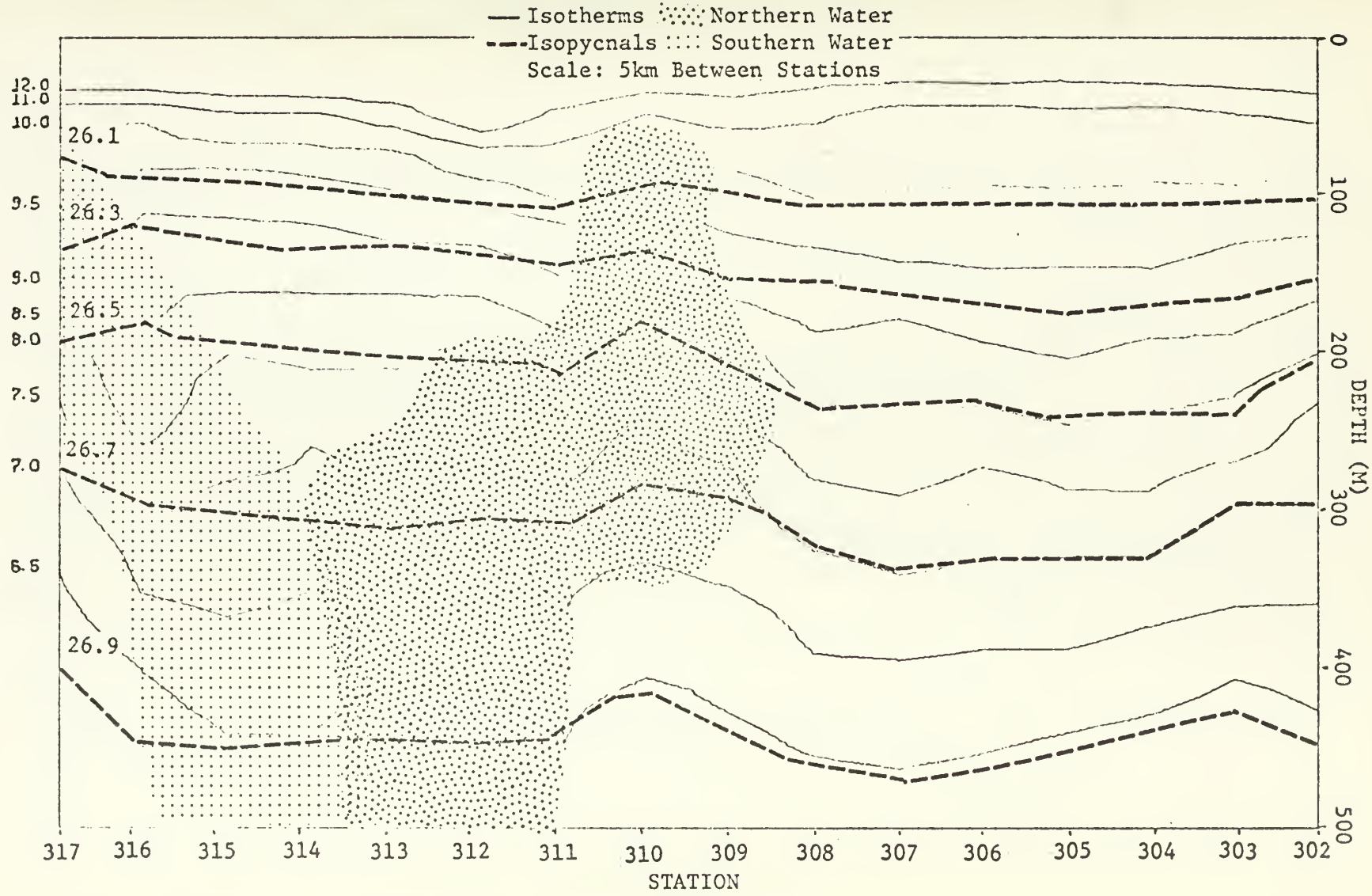

Fig. 7 Isotherms and Constant Sigma t Surfaces, Nov 1973.

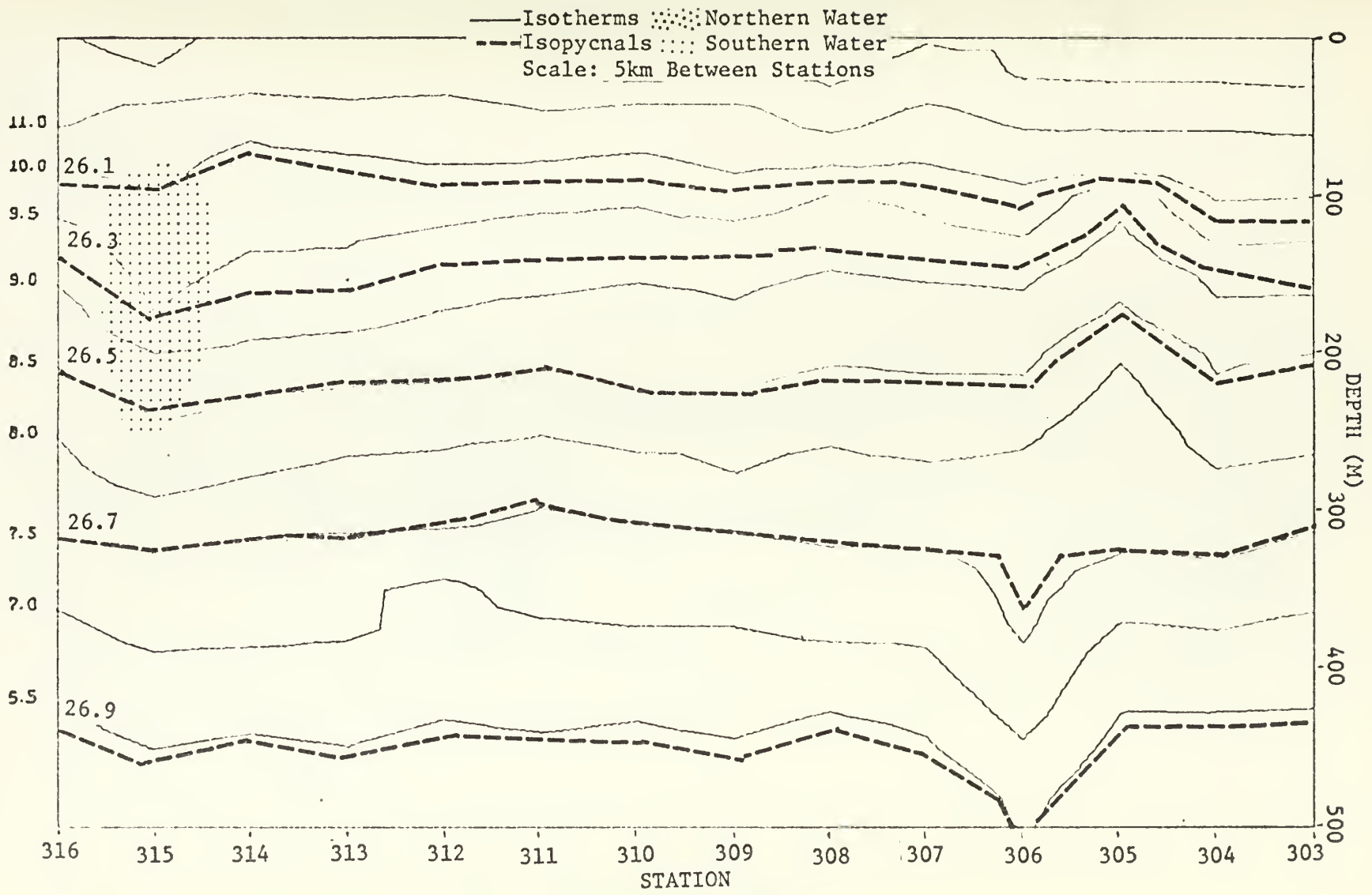

Fig. 8 Isotherms and Constant Sigma t Surfaces, Dec 1973.

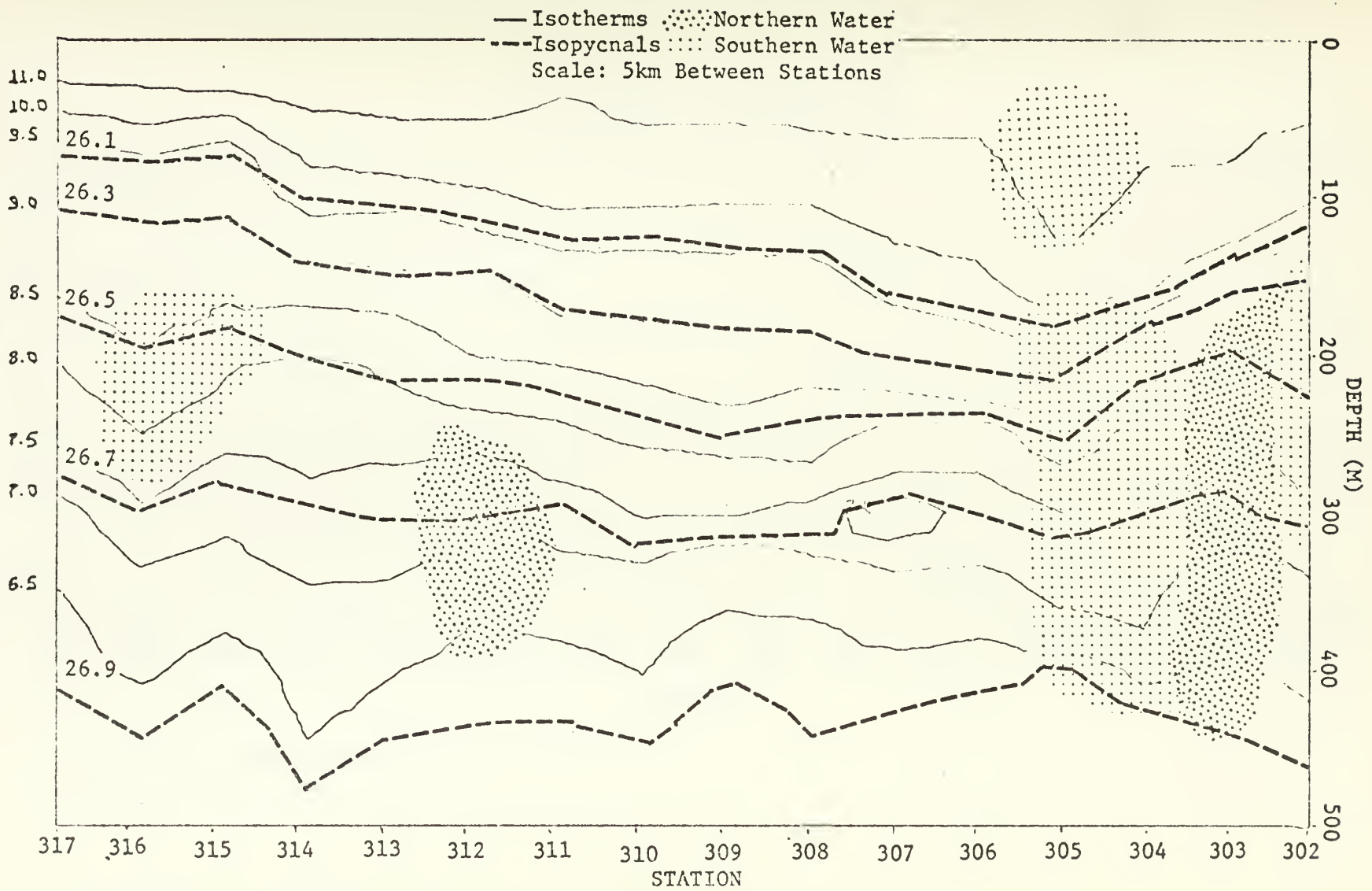

Fig. 9 Isotherms and Constant Sigma t Surfaces, Jan 1974.

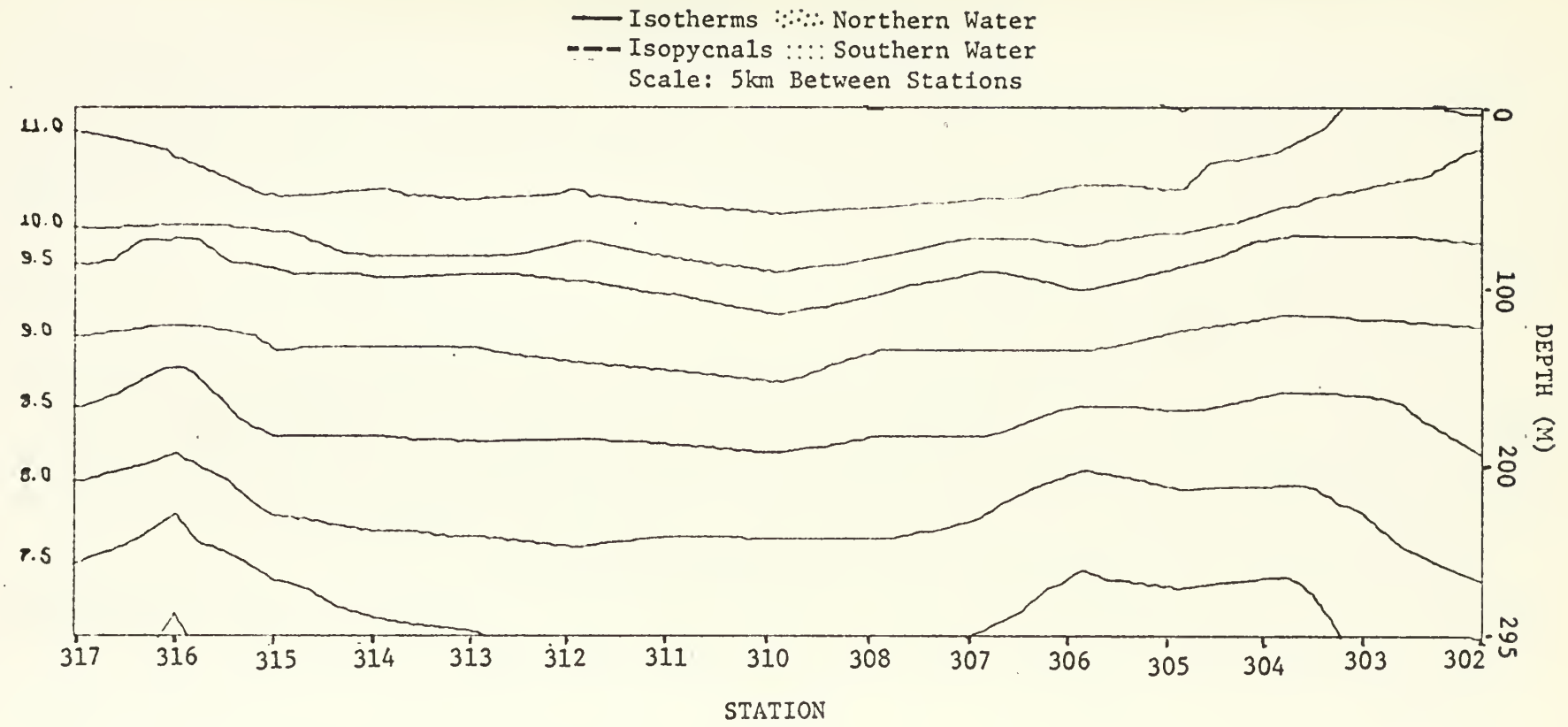

Fig. 10 Isotherms, Feb 1974.

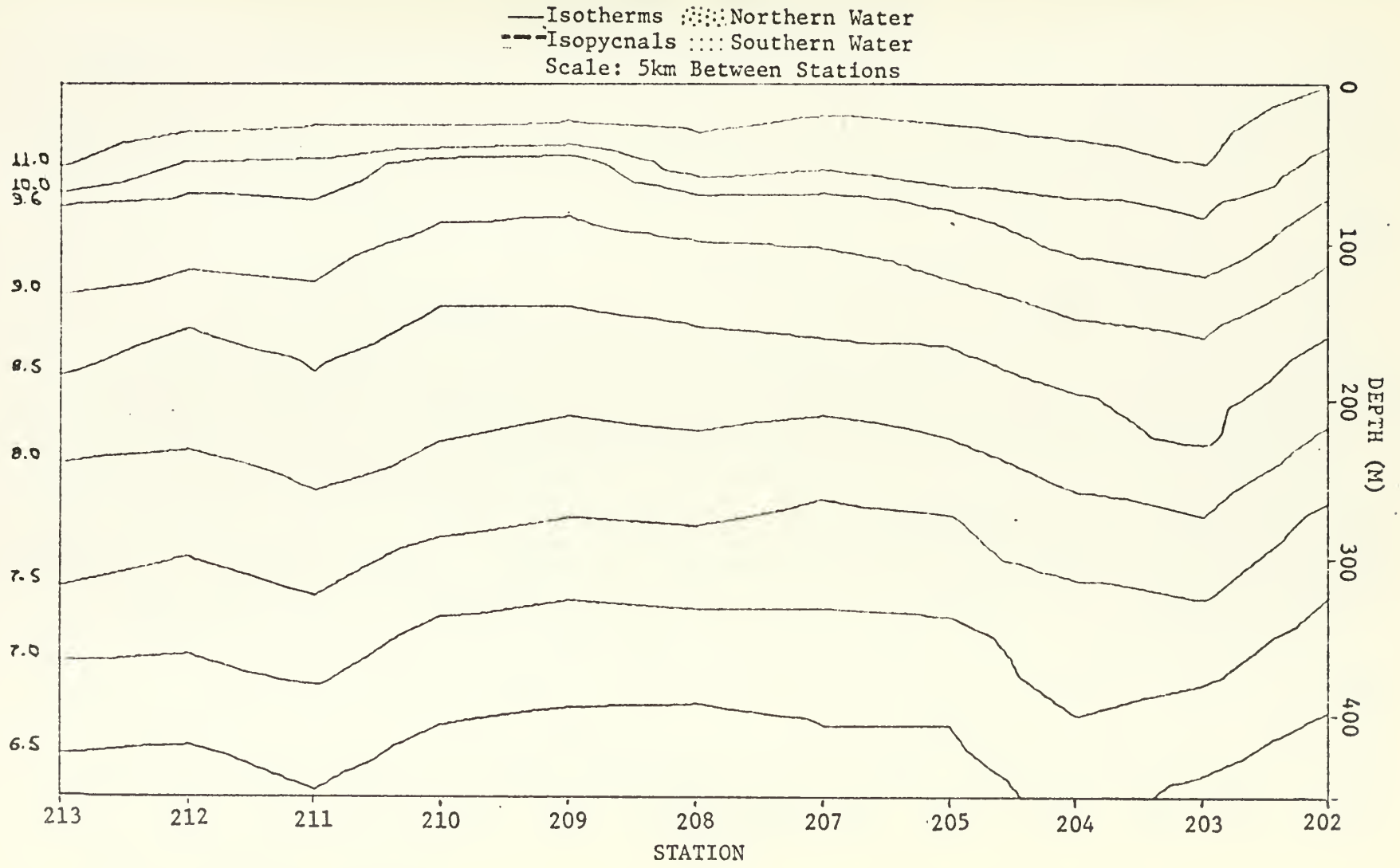

Fig. 11 Isotherms, Mar 1974.

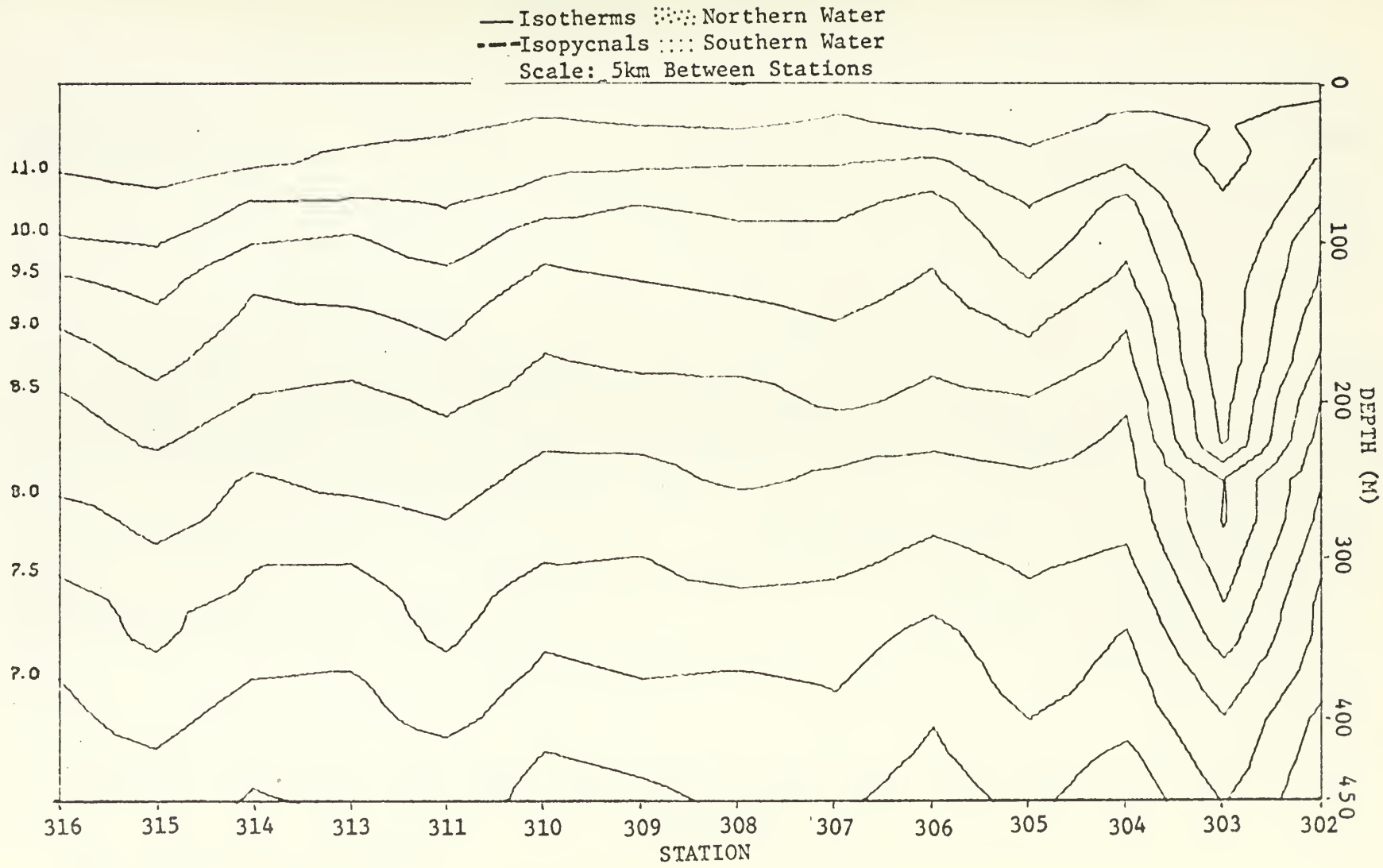

Fig. 12 Isotherms, Mar 1974.

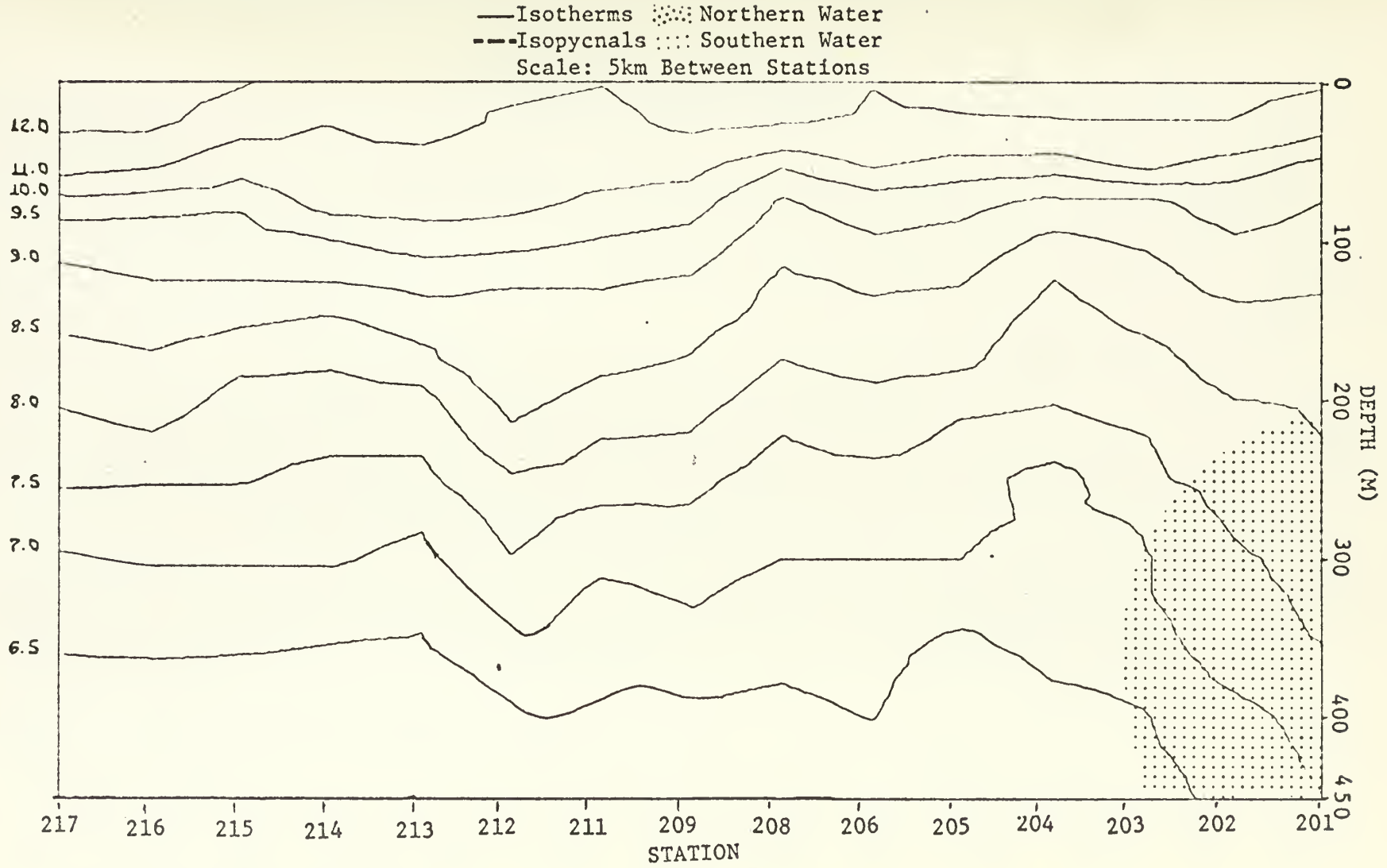

Fig. 13 Isotherms, May 1974.

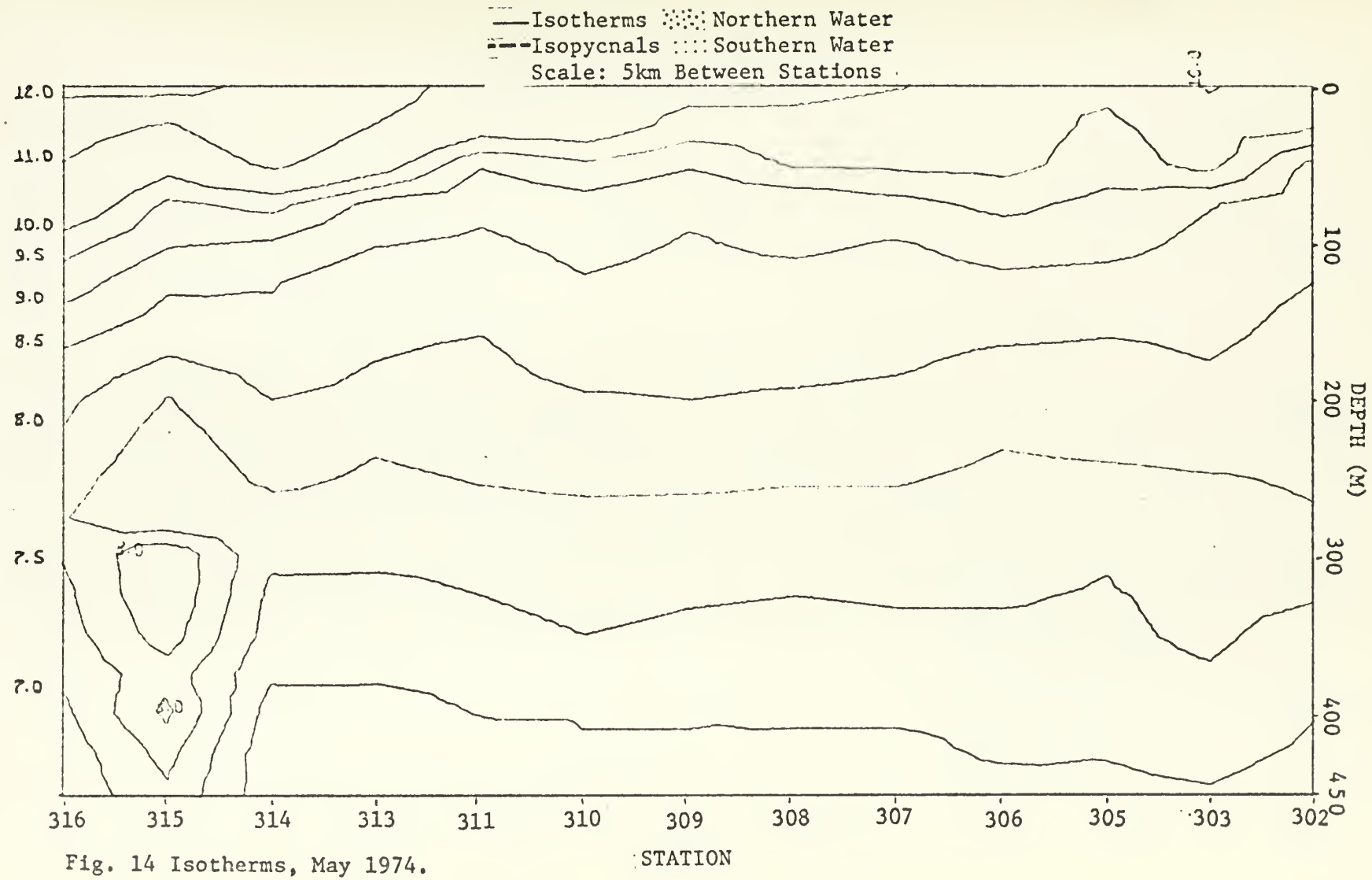

Fig. 14 Isotherms, May 1974.

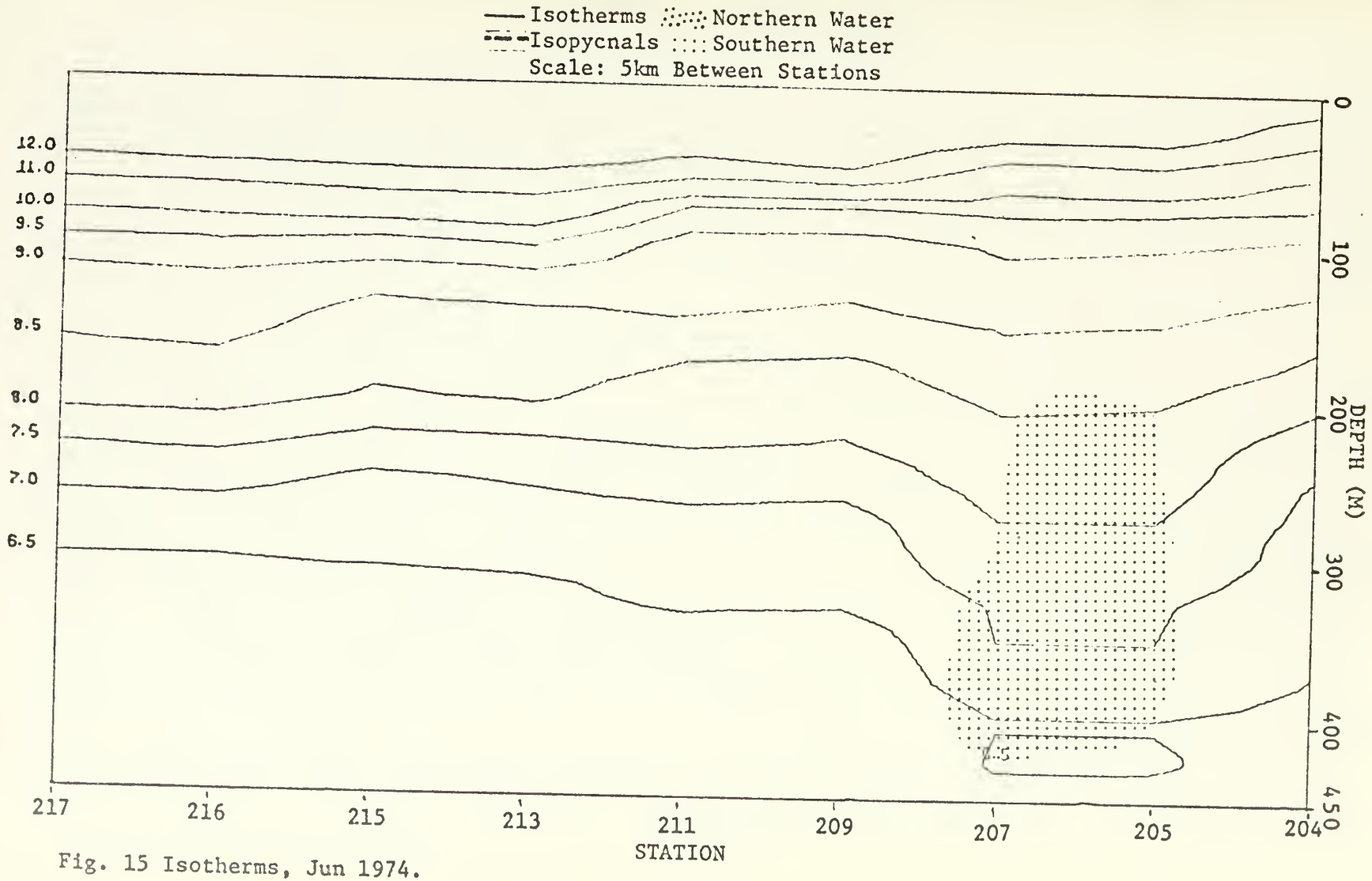

Fig. 15 Isotherms, Jun 1974.

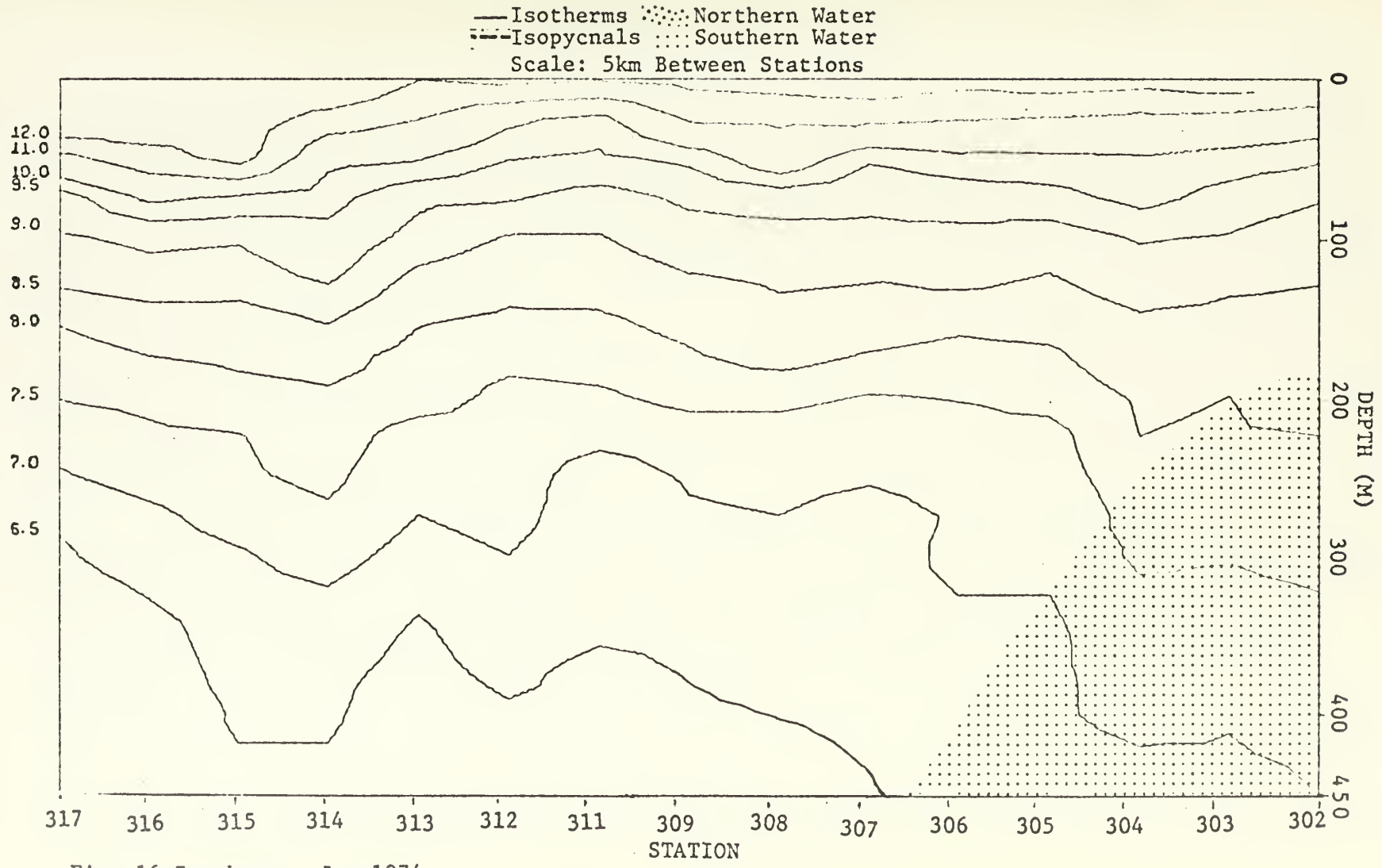

Fig. 16 Isotherms, Jun 1974.

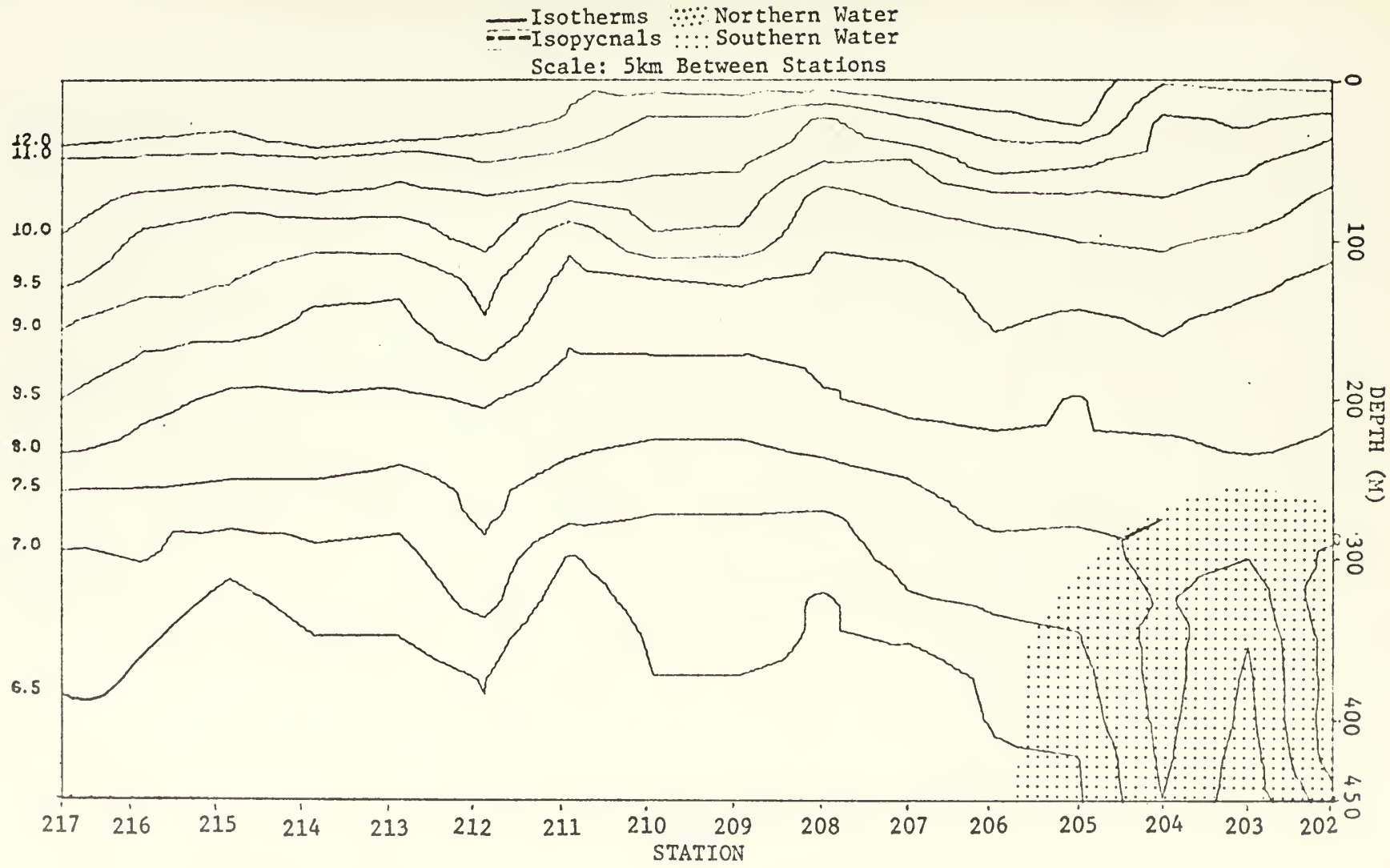

Fig. 17 Isotherms, Jul 1974.

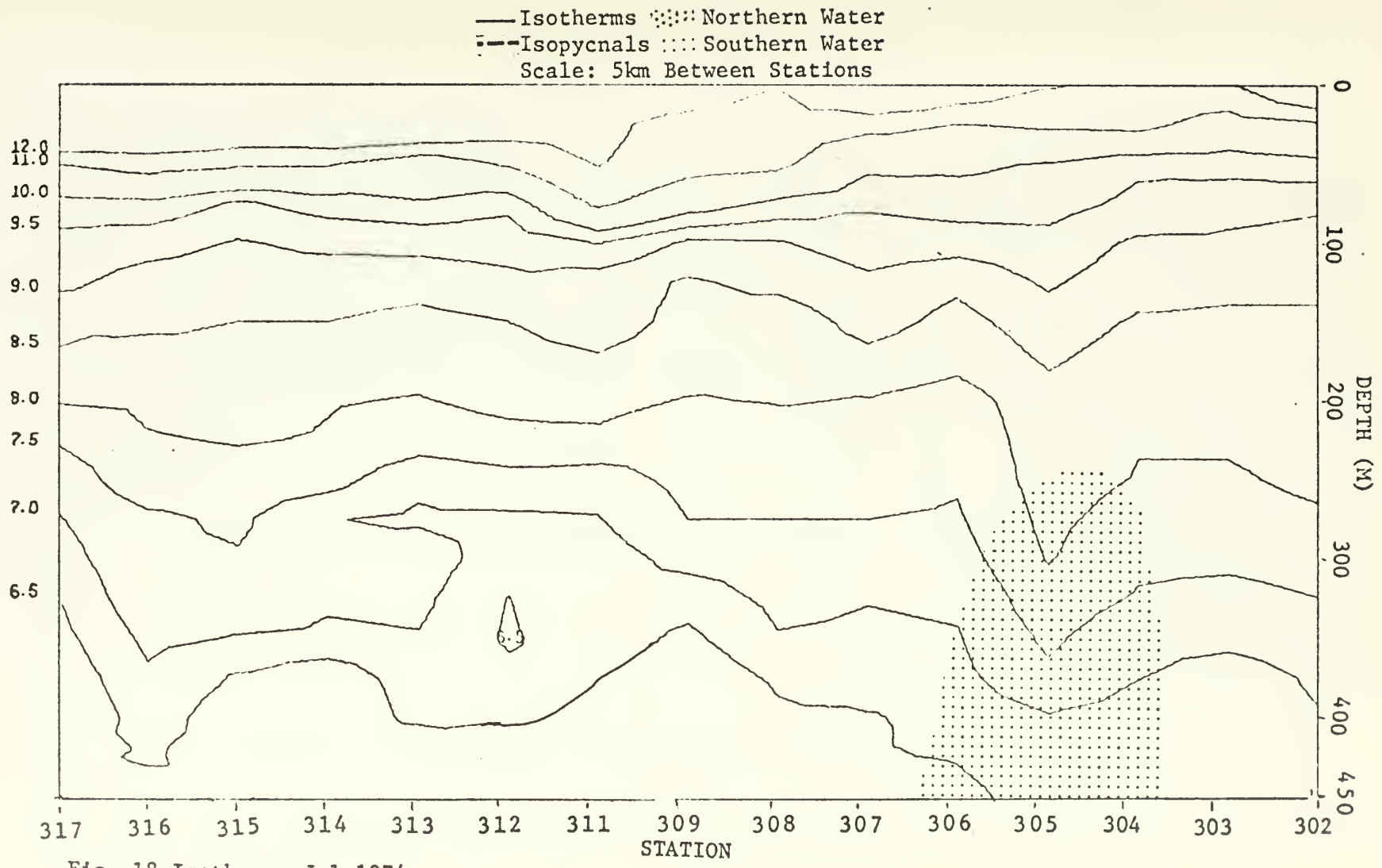

Fig. 18 Isotherms Jul 1974.

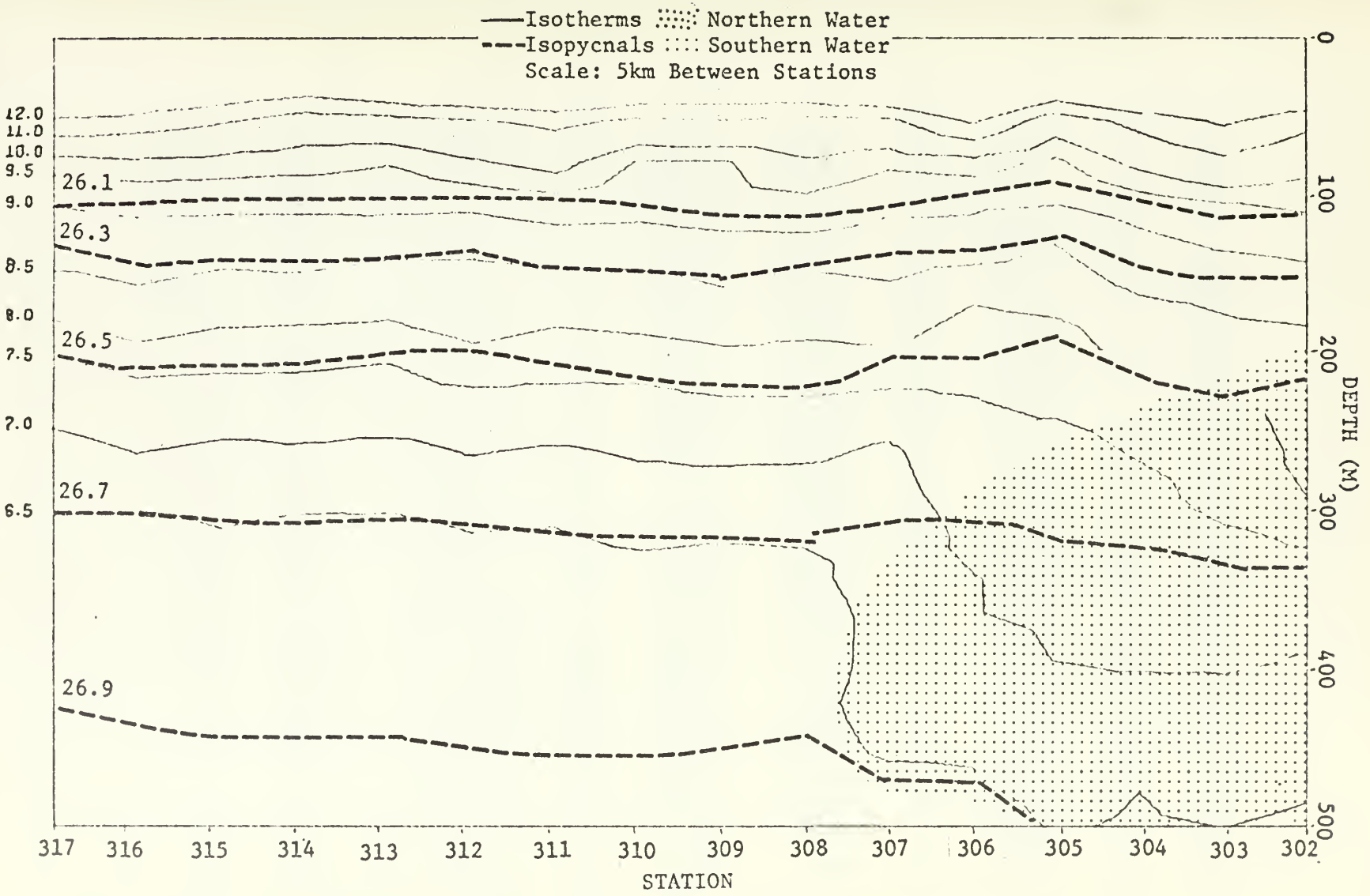

Fig. 19 Isotherms and Constant Sigma t Surfaces, Aug 1974.

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